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## Improved Independent Shuttle-motion Loom.

The advantages gained by making the motion of the shuttle independent of the velocity of the other parts of power looms, have already been fully set forth in these columns. These advantages are so manifest that inventors have for years sought to secure such a motion, and several have been illustrated in this journal within the past two years. We have now to add another, which secures the desired result in a very simple manner, combining several important features which are set forth below.

Fig. 1 is a perspective view of the loom with the improved shuttle-motion attachment, the details of which will be understood by referring to Fig. 2 in connection with the following description.

Power is communicated to the loom through the pulley, A, and shaft, B. The shaft, B, has formed thereon double cranks, which, through the medium of the connecting rods, C, give the required oscillation to the lay.

Through the medium of suitable gearing, D, rotation is imparted to the shaft, E. This shaft carries two cams, F, each of which has a hinged segment, G, which allows the motion of the primary shaft, B, and the shaft, E, to be performed in either direction without affecting the operation of the loom, and also permits the lay to be pushed back by the hand of the attendant at any portion of the revolution, without necessitating any re-adjustment of parts in starting the loom.

The cams, F, operate oscillating levers, H, pivoted at I, and having friction rollers pivoted to the ends which engage with the cams. The operation of the cams is to alternately thrust the back ends of the levers, H, inward at each revolution of the shaft, E. This alternately forces the opposite ends of the levers, H, outwards, against the lower ends of the vertical oscillating levers, J, against which the ends of the levers, H, press, but with which there is no possitive connection by pivots or links attaching the two sets of levers to each other.

The forcing out of the lower ends of the levers, J, in the manner described, causes them to alternately stretch the coiled springs, K, the inner ends of which are respectively linked to the tops of the levers, J, and the other ends of which are attached to the undersides of the lay beam, as shown.

Each of the levers, J, is attached by a leather cord, L, leading from its upper end to the picker, M, situated at the end of the lay race, R, opposite the lever. Other cords, N, lead from the pickers over pulleys, O, down to double pulleys, P, attached to the frame of the loom, as shown, upon which the cords, N, wind, as other cords, T, are unwound by the inward motion of the lower ends of the levers, J, to which they are attached.

The action of the movement is as follows: The revolution of the shaft, E, forces inwards one of the oscillating levers, H, thereby forcing outward the bottom of one of the levers, J, and forcing in its top so as to put tension in the spring to which it is attached. The opposite spring, being in this part of the movement released from tension, recoils, and drawing outward the top of the lever to which it is attached, and drawing inward the bottom of the same lever, imparts rotation to the double pulley, P, by unwinding the cord, T, which rotation winds upon the pulley the cord, N, and draws back the picker, M, to the rear end of the shuttle box, ready to make its stroke the moment the spring to which it is attached by the cord, L, is released by the let-off portion of the cam, F.

This simultaneous action of the movement at the opposite ends of the lay is alternated at each revolution of the shaft, E, so that while one spring is under stretch the other is making its recoil, and not only making the stroke of the picker at the other end of the lay, but also drawing back the picker which made the last stroke ready for the next alternate stroke, and so on.

If a thread break, the motion of the shuttle, S, may be instantly stopped by dogs, Q, which, by the use of the foot may be thrown into position to engage with the lower end of either of the levers, J, so as to prevent the recoil of the spring to which the lever is attached, and consequently the throw of the shuttle.

The advantages of an independent shuttle motion were specifically given in our article descriptive of Stever's Independent Shuttle-motion Loom, published on page 335, current volume, of the SCIENTIFIC AMERICAN.

It is claimed, however, that this loom gains an important advantage by dispensing with the semicircular picker-staff motion, and that the shuttle is on this account not nearly so likely to be knocked off the lay-race. It is also claimed that this movement is simpler and cheaper than any which has preceded it, while it fully attains all the other advantages secured in other independent shuttle movements.

The velocity of the throw of the shuttle is the same whether the picks be rapid or slow, and great rapidity is attainable. We are told that looms with this motion attached are now successfully run at a speed of 200 picks per minute without danger of too great strain upon the thread.

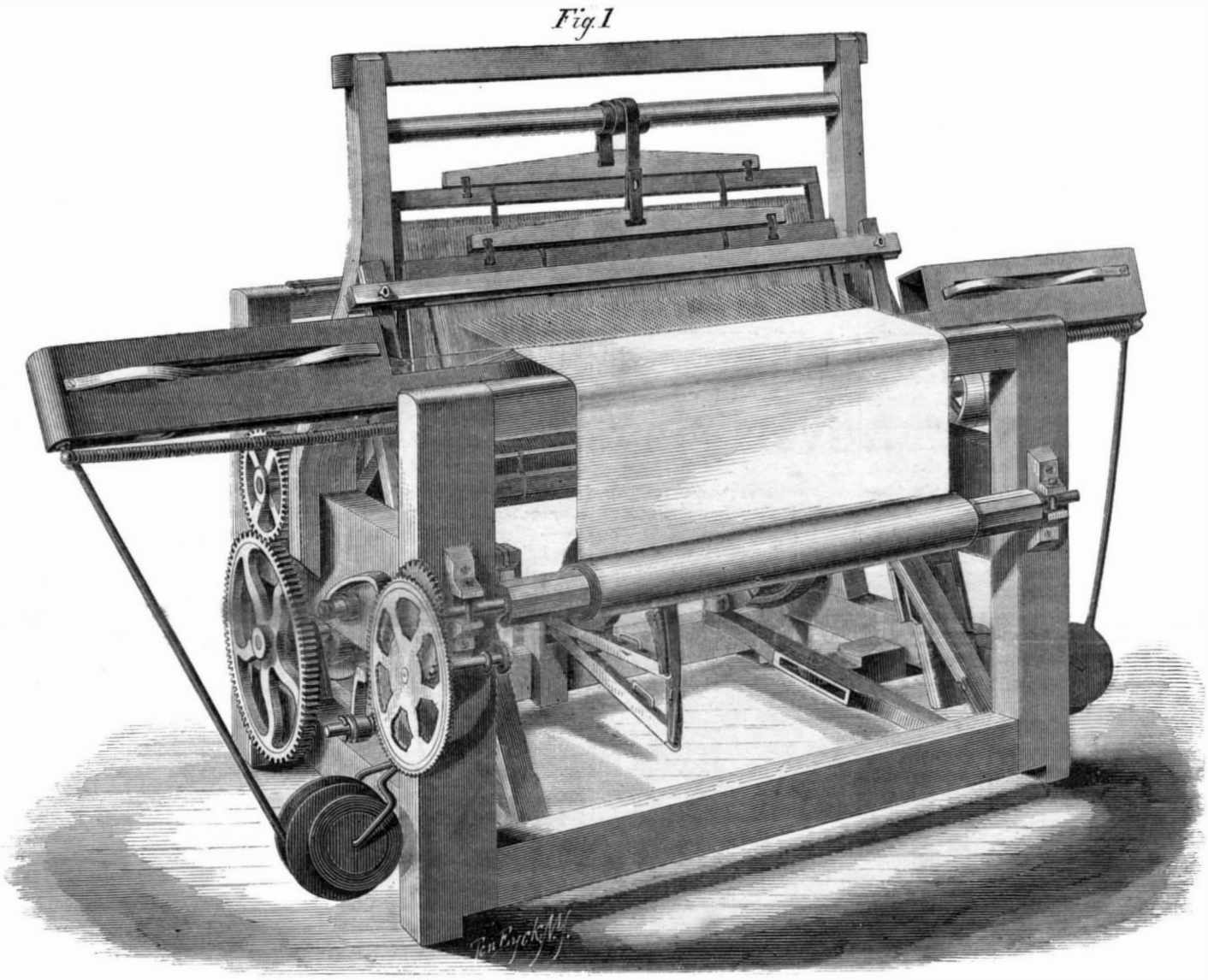
The movement can be attached at a cost of about $3·50 to any power loom in market except the Lyall "Positive Motion Loom."

The springs may be adjusted to different tensions to suit the character of the textures to be woven. Thus a uniformity in textures unattainable on the old looms, is always secured.

The pickers being self-sustaining and having a downward tendency in their movement, always maintain an upright position and always strike the shuttle at right angles directly in the line of their motion, giving greater stability of movement and allowing a high speed without danger of breakage. The reversibility of the cams without interfering with the operation of the pickers, secures the advantage that in stopping the loom to mend a thread of the warp, the lay may be moved back while the mending is done, and if the pitmans or connecting rods, C, are on the dead center, it is not necessary, as in old looms, to move the power wheel by hand to get the pitmans off the center. The work proceeds from the point at which it stopped, when the loom is again started.

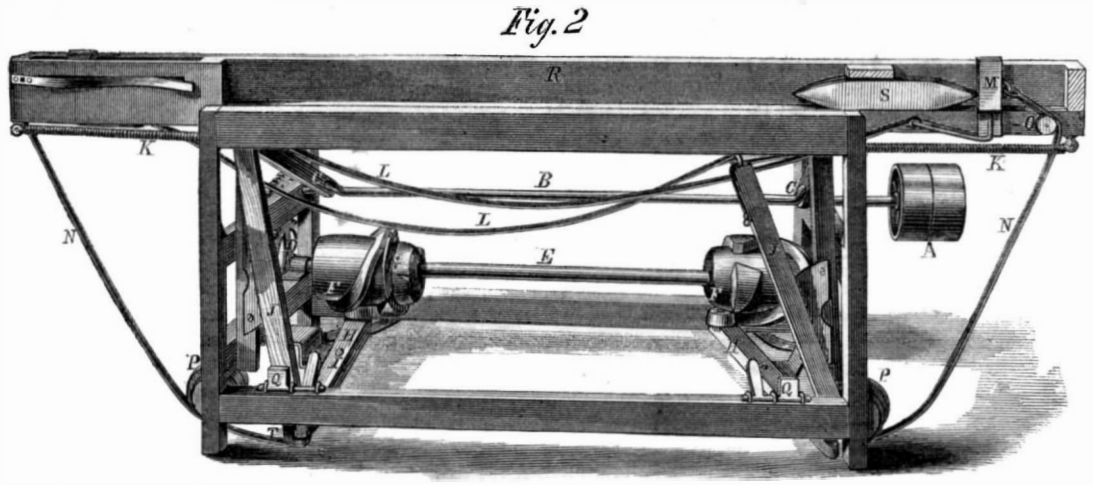
All the machinery is attached to the loom itself—no part to the floor; and the heavy surging motion of old looms is avoided, as well as much of their noise. Patented Dec. 13, 1870, by E. P. Terrel. Patents have also been applied for in all the foreign countries. For further information in reference to the sale of the patent for the United States, address F. M. Hamilton, West Liberty, Logan Co., Ohio, or Alexander A. C. Klaucke, Box 48 Washington, D. C.

Fig. 1



TERREL'S INDEPENDENT SHUTTLE-MOTION LOOM.

Fig. 2

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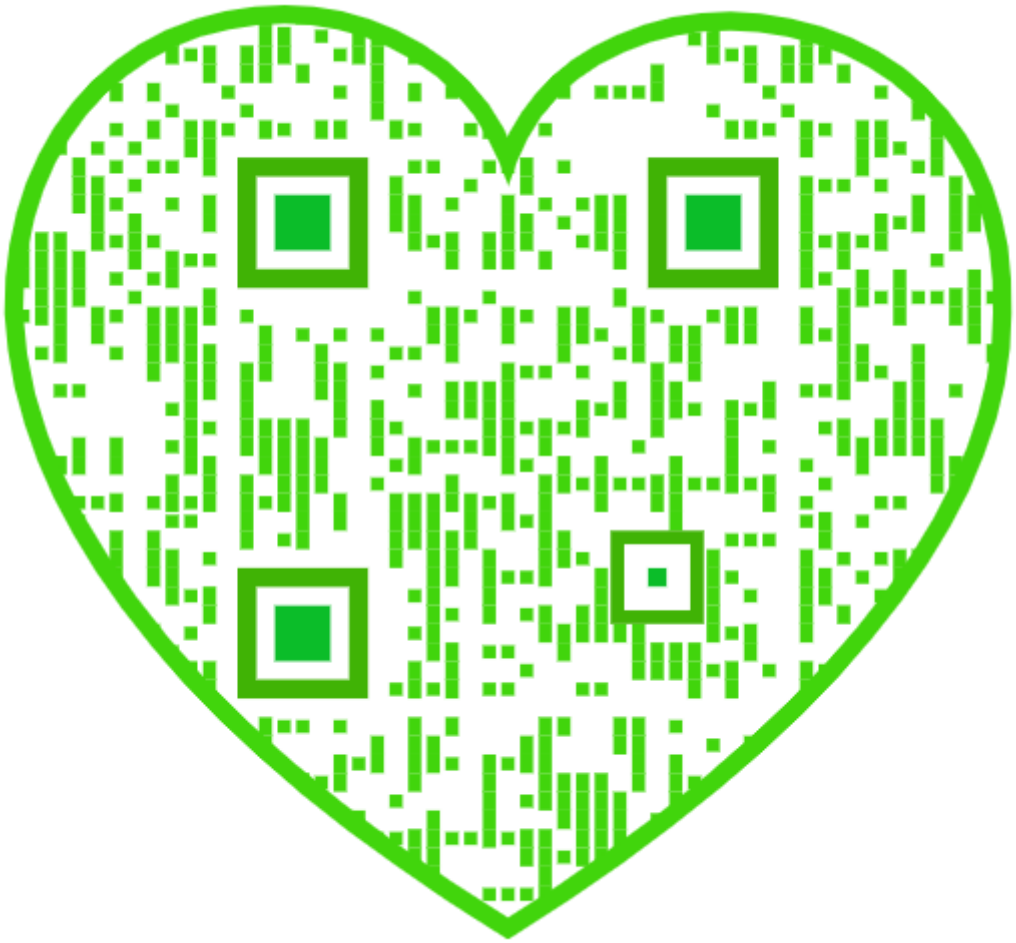

## PROGRESS OF FOREIGN INVENTION.

There seems to be considerable activity in invention abroad. The stimulating effect of the war on military invention seems, however, to be gradually subsiding. Among the chemical patents issued we notice a new process, patented in England, for making

ILLUMINATING GAS FROM TAR.

To prepare the material for this purpose the acid tar is placed in a suitable vessel (by preference lined with lead) and boiled up with open steam. The condensed water from the steam combines with the acid and sinks to the bottom and is drawn off. The alkaline tar is then run in, and the whole of the tars again boiled up. In this way any acid that may be present is neutralized, and leaves the tars in a purified state floating on the surface of the solution of salts, alkali, and other matters (the alkali may be recovered by evaporation). The purified tar can now be used for gas making by mixing it with small coal, or by running it into the retorts after the charge of coal has been introduced, but it does not do so well to run it into the retorts in this state, as it is apt to choke up the running-in pipe with carbonaceous matter.

Interesting to nautical men is a newly patented

STEERING GEAR,

which is an ingenious application of hydraulic pressure to move the rudder. The rudder head is provided with a strong tiller, which is actuated by means of a pair of hydraulic rams placed horizontally on each side of the tiller athwart the ship. These rams are connected together at their inner ends, between which they carry a block or bush, which works on the turned cylindrical end of the tiller, and which permits the tiller to slide radially. These hydraulic cylinders have branches attached to their outer ends, to which strong hydraulic pipes terminate in a slide valve chest having three ports—namely, one of the end ports, communicating with one of the above named hydraulic cylinders, which the inventor calls the port cylinder; the other extreme part with the other or starboard cylinder, and between these two ports the exhaust port is laid.

Of higher scientific interest is an

ASTRONOMICAL INSTRUMENT

called the "Heliade," by means of which the true time at any portion of the day may be discovered, as well as the latitude, longitude, and meridian line of the place where the instrument may be. It consists of a rectangular box hung so as to turn on two pins, and the axis of which passes through the center of the volume of the box in the direction of its length. The axis of the two standards is perpendicular to the base, which pivots horizontally on a support, whose legs are composed of screws, by means of which the base may be maintained in a perfectly horizontal position, which forms an essential condition for the exactitude of the observations. This true horizontal position is ascertained by means of two water levels fixed at right angles on the base. A screw nut serves to arrest the pivoting movement when the box is in the desired position. Inside the box are two hollow demi-cylinders with their concave parts standing back to back at the center of the volume of the box. Their bases form exact half circles. These demi-cylinders are graduated in their concave part by means of lines parallel with the hemicycle of the base, and of others perpendicular to the first, and parallel with the generating line of the cylinder. This instrument resembles in its general features the heliorama, recently illustrated and described in this journal. It is the invention of F. M. Pannerat, of Paris, France.

The question of the disposal of sewage is now attracting the attention of the most able chemists as well as engineers throughout the civilized world. Among others, C. M. Tessie du Motay, the discoverer of the process for making oxygen, so often referred to in these columns, has devised and patented a process for

TREATING EXCREMENTS

which may prove valuable. The chief objection to it will probably be the cost, though as some of the substances employed are useful as fertilizers, they may perhaps add enough to the value of the matters treated to in a measure compensate for their use. Taking human or animal excrement the inventor disinfects it by one of the metallic salts or antiseptic agents which are now employed, when it contains ammonia in the state of sulphur hydrates or sulphurets, or sulphureted hydrogen in the free state. After this operation he adds to the mixture of solids with liquids or separately or united in one and the same liquor, soluble phosphate, acid, or neutral magnesian salts, fluosilicic acid, or even soluble fluosilicates, alkaline tenons or metallic, such as fluosilicates of lime, of magnesia, of alumina, of iron, and the like. When the reagents separately or collectively employed have reacted upon the soluble portion of the excremental matters in such a manner as to form a combination with them, the inventor adds, in order to cause them to pass from the acid into the neutral or alkaline state, either lime or carbonate of lime or magnesia or carbonate of magnesia. If after this treatment the excrement still gives off sulphohydric odors, a metallic salt should be added in order to complete its disinfection.

Among the curiosities of the patent announcements, we find one completed for a

PERPETUAL MOTION,

the invention of R. M. Marchant, of Torrington Square, London. The inventor compresses by stages the air, steam, or gas to be used as a motive power by means of pumps, a separate pump and chamber being provided for each stage, and the pumps being constructed in such manner as to prevent leakage by the provision that the air charge shall in every pump or chamber be passed, by the law of gravity, through the water in such pump or chamber to a higher level, so that all pressure tending to leakage shall as far as practicable be exercised by water on the joints, with which joints the air is precluded from coming in contact by the difference of its gravity. This meager description hardly indicates where the self-motive power is to come from, but those who are sufficiently versed in the attempts made to secure perpetual motion by the use of fluids of different densities will see in this device a familiar principle which has always failed to secure the desired result. A more complete description would therefore only show in a clearer light the folly of the inventor.

Mr. E. Weare, of Stonehouse, England, has patented a method of

UTILIZING WASTE THREAD

in the manufacture of textile fabrics. He accomplishes the end sought by returning the waste threads to the condensing carding engines by means of mechanism, the greater part of which is attached to one of the scribblers, by preference to the last. Over the end of the carding engine, rollers are fixed, over which rollers the waste thread from one side of the engine is conducted to the other side, and the threads from the two sides of the engine thus brought side by side. The waste threads are taken up by or coiled upon, a roller or spool driven by any convenient gearing from the carding engine or otherwise; and the said roller or spool, when filled with the waste threads, is conveyed to the scribbler (the axis of the roller or spool placed in suitable supports), and made to bear or rest on a second roller or drum, which has a slow, uniform rotary motion communicated to it, whereby the waste threads are uniformly delivered into the sliver as it comes off the scribbler. The sliver passes to the condensing carding engine in the usual way.

PENTAGRAPHIC EMBROIDERY

is a name applied to an ingenious method of performing ornamental needlework, invented by Mr. Billwiller, of St. Gall, England. A number of jointed frames are employed, each carrying tambouring or sewing apparatus. They are so arranged and connected together that the needles they carry may be made to traverse in any direction over the surfaces of the fabrics to be embroidered, and that the movements of the several needles shall be simultaneous and similar. The needle frames are also connected with a pentagraph having a tracing point capable of being led by the workman over the lines of a pattern which it is desired to copy, and when this is done the needles will each travel in and work along a path similar to that passed over by the tracing point. Thus each needle will produce embroidery resembling the pattern, but not necessarily of the same size; usually it is preferred that the pattern should be on a larger scale than the work produced by its means.

## Professor Helmholtz on Faraday.

Preface to the German Edition of "Faraday as a Discoverer." Translated by Prof. Tyndall.

The name of Faraday is one to be held in reverence by all natural philosophers. Many times in London, in connection with lectures which I delivered at the Royal Institution, I had myself the privilege of his obliging help and the pleasure of his amiable society. The perfect simplicity, modesty, and undimmed purity of his character gave to him a fascination which I have never experienced in any other man. I had therefore a duty of gratitude to fulfill towards him.

But apart from this, and apart from that friendship for Faraday's younger associate and successor, the author of this book, which induced me to undertake the task, I believed that I should render a service to German readers by facilitating, as far as in me lay, an insight into the action and character of a mind so richly and peculiarly endowed, and so entirely the product of natural growth.

It is, moreover, by no means for the philosopher only that such an insight possesses interest. His interest, certainly, is the most immediate, for it has hardly been the lot of any single man to make a series of discoveries so great and so pregnant with the weightiest consequences as those of Faraday. Most of them burst upon the world as surprises, the products, apparently, of an inconceivable instinct; and Faraday himself, even subsequently, was hardly able to describe in clear terms, the intellectual combinations which led to them. These discoveries, moreover, were all of a kind calculated to influence in the profoundest manner our notions of the nature of force. In the presence of Faraday's magneto-electric and diamagnetic discoveries more particularly, it was impossible for the old notions of forces acting at a distance to maintain themselves without submitting to essential expansions and alterations. The clearer expression of these changes is at the present hour the object of physical science.

In what way such extraordinary results were achieved is naturally a question of the first interest to the investigator who strives after similar though more modest ends. But Faraday's development appears to me to possess no small human interest in relation to many theoretic questions of psychology, and to the art of education. The external conditions under which he cultivated those striking capacities which excite our wonder were the simplest that can be imagined. He was completely self-taught; brought up in humble circumstances, having received no more than the commonest instruction, and having been only favored by fortune in the circumstance that when he was a poor apprentice to a bookbinder, he found, at the right time, a helper in Humphry Davy, who recognized his peculiar gifts, and procured for him the possibility, though in a subordinate position, of working in the direction towards which his genius impelled him.

And throughout his whole life and labors the advantages and disadvantages of such a mode of development reveal themselves in simpler and larger traits than in the case of most other similar celebrated names. The principal advantage rose undoubtedly from the fact that his intellect was not too soon subjected to theoretic fetters, but enjoyed its freedom in the presence of natural phenomena; and that instead of book learning, he permitted the fulness of nature herself to operate upon his open mind. The disadvantages are, perhaps, of a subordinate kind; but they reveal themselves in quite as unmistakable a manner when he strives to give expression to his ideas, and to supply, by all kinds of sensuous imagery, the want of mathematical culture. This is manifestly the way in which he alighted upon his lines of force, his ray vibrations, and other notions, which bewildered the investigators of his time, and the truer and clearer meaning of which has been in part made out by mathematical theory since Faraday himself ceased from his labors.

And still, in this unlearned son of a smith, who held fast throughout his life the pious creed of his fathers, ran a vein of philosophy which gave him the right to be ranked among the foremost of those engaged in the general intellectual travail of our age. That, as Tyndall informs us, he retained the term "natural philosophy," usual in England to express physical science, and the name "philosopher" for the cultivator of that science—lies essentially in the nature of his work. After the science of our age, in its laudable efforts to make human knowledge a true image of the actual universe, had shattered many an old metaphysical idol, it halted amid the transmitted forms of physical ideas regarding matter, force, atoms, and imponderables. These names were even converted into new metaphysical shibboleths by those who thought themselves most advanced in the way of enlightenment.

It was these ideas that Faraday sought in his riper labors to purify from everything theoretical which was not the true and immediate expression of the facts. More especially he opposed the action of forces at a distance, the assumption of two electric fluids and of two magnetic fluids, and, in like manner, all hypotheses which contradicted the law of the conservation of force, of which he had an early presage, though he singularly misapprehended its mathematical expression. And in these precise directions he exercised, in the first place, the most unmistakable influence on the physicists of England. The mathematicians among them, especially, labor to render theories of phenomena the pure and true expression of the laws of fact, to the exclusion of all arbitrary theoretic devices. In this way Faraday's ideas, though in a modified form, often reveal themselves with their true significance assigned to them.

## Responsibility for Detention of Advertised Trains and for Accidents.

The English courts hold the railway companies to a pretty strict rule in regard to their relations with the public convenience and the public safety. A case of long standing has recently been tried in the Court of Exchequer, the result of which is a case in point. A season-ticket holder found the advertised train not going to start, in consequence of the fireman having neglected to keep up steam, and ordered a special train. The bill for this was about two hundred dollars. The sharp passenger paid it, and then brought an action for the recovery of the money and some fifty dollars additional for his own loss of two hour's time. The judge expressed himself "astonished" that the company had resisted such a claim, and the jury gave the plaintiff a verdict for all he asked.

If we should import a little English law or an English judge or two, it might prove of advantage to the American public. In England likewise accidents to persons or property, from the carelessness or neglect of railway officials or employés, are punished by heavy pecuniary assessments under the head of damages. Verdicts to the amount of thirty or forty thousand dollars for personal injury have been recovered, and we read of one case where the jury rendered a verdict of over fifty thousand dollars. These heavy verdicts, however, do not seem to prevent disasters. In the Board of Trade Returns for Great Britain, for 1868, it is stated that nine railways in England and Wales paid for compensation for accidents on their roads the sum of $2,103,855, of which $1,407,940 were for injuries to persons, and $605,915 were for damages to goods. The compensation for accidents in 1869, it is anticipated, will amount to a larger sum than that above stated.

The English managers are much in favor of settling claims for damages by arbitration instead of trusting the matter to a jury, and in this we think they are wise; and we believe likewise it is better for both parties. Arbitration simplifies the whole proceeding, saves time and expense, and, if the arbitrators deal fairly with the facts of a case submitted to them, justice will not be so likely to be delayed or defeated by merely legal technicalities. Another very sensible decision was recently decided by an English court, to this effect, that a railway company is not responsible for the loss of articles from a passenger's portmanteau, which had been left by the owner in one carriage while he traveled in another, his own negligence having made the loss possible.—*Railway Times.*

A NEW MODE OF EVOLVING LIGHT.—Mr. Andrew Pritchard writes to *Nature* as follows: "A singular phenomenon of the evolution of light has been recently observed by me. By tearing sharply a piece of twilled calico into strips in a room well guarded from light, a perceptible luminosity was clearly distinguishable, which appeared at its maximum at the final parting of the fabric. This phenomenon is exceedingly well marked in dry, new calico, and appears to me due to the dressing, as after being washed no light is evolved. Whether attributable to electricity, phosphorescence, or fluorescence, I leave for further investigation. The light appears similar to that produced on breaking a lump of sugar in the dark. So far as I can ascertain, the phenomenon of light being evolved on tearing a fabric is new."

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### Effects of Compressed Air on the Men Employed in the Caisson of the East Pier of the St. Louis Bridge.

[From the Report of the Chief Engineer, Capt. James B. Eads.]

The first symptom manifesting itself, caused by the pressure of the air, is painfulness in one or both ears. The eustachian tubes extending from the back of the mouth to the bony cavities over which the drums of the ears are distended, are so minute as not to allow the compressed air to pass rapidly through them to these cavities, and when the pressure is increased rapidly the external pressure on the drums causes pain. These tubes constitute a provision of nature to relieve the ears of such barometric changes as occur in the atmosphere in which we live. The act of swallowing facilitates the passage of the air through them and thus equalizes the pressure on both sides of the drums, and prevents the pain.

The pressure may be admitted into the air lock so rapidly that this natural remedy will not in all cases relieve it. By closing the nostrils between the thumb and fingers, shutting the lips tightly, and inflating the cheeks, the eustachian tubes are opened, and the pressure on the inner and outer surfaces of the tympanum is equalized, and the pain prevented. This method must be used and repeated from time to time as the pressure is let on, if it be increased rapidly. No inconvenience is felt by the reaction when the pressure is let off, as the compressed air within the drums has a tendency to open the tubes, and thus facilitates its escape through them; whereas increasing the pressure has the effect of collapsing them, and therefore makes it more difficult to admit the compressed air within the cavities of the ears. It frequently occurs, however, from some abnormal condition of these tubes, as when inflamed by a cold in the head, that neither of these remedies will relieve the pain. To continue the admission of compressed air into the lock, under such circumstances, would intensify the suffering, and possibly rupture the tympanum; therefore the lock tenders were particularly instructed to shut off the compressed air at the moment any one in the lock experienced pain about the ears; and then, if it could not be relieved by the above means, the lock was opened and the person was not permitted to go through into the air chamber. Sometimes fifteen minutes were occupied in passing persons through the first time, after which they usually had no further trouble from this cause.

The fact that the depth penetrated by the air chamber was considerably greater than that hitherto reached in any similar work, left me without any benefit from the experience of others in either guarding against any injurious effects of this great pressure upon the workmen and engineers subjected to it, or of availing myself of any known specific for relieving those affected by it.

When the depth of sixty feet had been attained some few of the workmen were affected by a muscular paralysis of the lower limbs. This was rarely accompanied with pain, and usually passed off in the course of a day or two. As the penetration of the pier progressed the paralysis became more difficult to subdue. In some cases the arms were involved, and in a few cases the sphyncter muscles and bowels. The patients also suffered much pain in the joints when the symptoms were severe. An average of at least nine out of ten of those affected suffered no pain whatever, but soon recovered, and generally returned to the work.

The duration of the watches in the air chamber was gradually shortened from four hours to three, and then to two, and finally to one hour.

The use of galvanic bands or armor seemed, in the opinion of the Superintendent of Construction, the foremen of the chamber, and the men, to give remarkable immunity from these attacks. They were all ultimately provided with them. These bands were made of alternate scales of zinc and silver, and were worn around the wrists, arms, ankles, and waist, and also under the soles of the feet. Sufficient moisture and acidity were supplied by the perspiration to establish galvanic action in the armor, and as the opinion of those most accustomed to the chamber was almost unanimous in favor of this remedy, I am very much inclined to believe it valuable.

Immediately on the manifestation of greater severity in the symptoms, a hospital boat was fitted up at the pier, and one of the ablest physicians in the city (Dr. A. Jaminet) was engaged to attend those affected, and also to institute such sanitary measures as his judgment should dictate. A careful examination of the health and bodily condition of every workman was daily made, and none were permitted to engage in the work without the approval of Dr. Jaminet. Those most severely affected were sent to the city hospital and had the benefit of the advice and treatment of its resident physician, Prof. E. A. Clark.

The total number of men employed in the air chamber of this pier was 352. Of this number about thirty were seriously affected. Notwithstanding the care and skill with which those most severely attacked were treated, twelve of the cases proved fatal. Each one of these, without exception I believe, was made the subject of careful inquest by the coroner, aided by an autopsy conducted usually by some of our most skillful surgeons and physicians.

Whilst the exciting cause in all of these cases was doubtless the exposure of the system to the pressure of the condensed air of the chamber, the habits and condition of several of those who died were, at the time they went to work, such as would have excluded them from it if subjected to the examination of Dr. Jaminet, and the verdict in about one half of the cases gave a totally different cause for the death of the patient. Nearly or quite all of these deaths happened to men unaccustomed to the work; several of them to men who had worked but one watch of two hours. In contrast to this is the fact that quite a large number of the men (certainly one half of those constantly employed) commenced with the work at its inception and remained throughout its continuance entirely without injury or inconvenience.

The gentlemen composing the engineer corps of the bridge all visited the air chamber, some of them quite often, either in the discharge of their professional duties, or from motives of curiosity, and none of them suffered any injury whatever.

Much diversity of opinion was expressed by the medical gentlemen who investigated the symptoms and held autopsies of the deceased. Some of these gentlemen maintained that a slower transition from the abnormal to the natural pressure would have been less injurious; others claimed, on the contrary, that it was from the too rapid application of pressure in passing from the natural into the compressed air. The fact that the air lock tenders were in no case affected, although subjected many times during a watch of two hours in the air lock to rapidly alternating conditions of the atmosphere, at one moment in its normal state in the lock, and five minutes later exerting a pressure of fifty pounds per square inch upon every part of the body, would seem to prove both of these theories unsound, and lead us to believe that in the length of time to which the human system is subjected to this extraordinary pressure exists the real source of danger, and not from any rapid alternations of pressure to which it is exposed.

After the caisson reached the rock, I have frequently, when passing through the air lock, admitted the compressed air into it so quickly that none but those well accustomed to it could relieve the pressure upon their ears, and yet I felt no ill effects whatever from this rapidly increased pressure; and in going out I have let the pressure off so fast that the temperature in the lock has fallen thirty-two degrees (F.) in consequence. These transitions occupied but three or four minutes.

The fact that the air chamber was briefly visited by thousands of persons, including many delicate ladies, even after it had reached the bed rock, some remaining as long as an hour in it without any of them experiencing the slightest ill effects from the pressure, and the fact that no cases of any importance whatever occurred among the workman after the watches were reduced to one hour, satisfies me that this is the true cause of the paralysis, and that by lessening still more the duration of the watches, a depth considerably greater can be reached without injury to the workmen. Too long a continuance in the air chamber was almost invariably followed by symptoms of exhaustion and paralysis. Dr. Jaminet, on one occasion, remained in two and three quarter hours when the depth was over ninety feet, and was dangerously attacked soon after reaching home.

### Hoosac Tunnel---Trial of Dualin.

EAST END.

About fifteen hundred pounds of dualin in cartridges ready for use, reached here from Neponset ten days since, being the sixth attempt to supersede nitro-glycerin. The inventor of this compound arrived on the 28th ult., for the purpose of superintending its application in person. As this parcel had been specially prepared for the purpose, guided by the results of five previous experiments at various points of the tunnel, "great expectations" were raised, as to the results. One of the slopes then being operated upon by nitro-glycerin and having a burden of eight feet, which was being thrown down every blast, bottoming every hole, was offered for the experiment. Similar charges of dualin were substituted for nitro-glycerin; the dualin was utterly unable to move the rock—the inventor asserting that this failure arose from the cold weather having affected the compound, the charges were thereupon warmed, but with no better result. Some charges were now inserted in holes having a burden of two feet, instead of eight; these removed the rock, but as powder would have done the same work, this was not deemed a seccess. Meanwhile some 400 pounds of dualin were teamed to the central shaft, but as the results of three days' blasting at the east end were reported of "no account" this has not been used. We believe the results now attained with nitro-glycerin at the east end, and above described, viz.: Taking out the roof full width of the tunnel with a single series of seven drill holes having an eight-feet burden, and bottoming every hole, indicates admirable direction of the work, and argues well for the speedy completion of the tunnel. Progress during November, 133 feet.

WEST END.

Well No. 4. Messrs. Hocking & Holbrook have commenced using nitro-glycerin in their sub-contract, for the purpose of removing the rock preparatory to putting in the brick arch at that point; their first blast of nitro-glycerin in five holes, was tried on Monday with satisfactory results, and hereafter they intend to substitute it for powder, except in trimming. It seems to produce less jar, and it is anticipated will be less injurious to the brick work that is completed, than blasts with powder—besides expediting the work and saving money. Sixty-three feet of brick arch were completed during the month ending November 30.

WEST SHAFT.

The progress of the heading at this end, we understand, during the month of November, has nearly equaled that attained at the east end. When it is remembered previous to the present contract 40 feet was more than average at this point, the progress, 130 feet during the past month, is very satisfactory.

CENTRAL SHAFT.

The advance made in the two heading just opened during November was 76 feet. Considering that this rock has to be twice handled, and then lifted over 1,000 feet to the surface; such progress by hand drilling is very extraordinary work, but as Mr. Walter Shanley has been on the ground during the month, all the time, this may afford the clue how it is the headings are being driven at such a rate, by handdrilling.

It will be observed that with the most strenuous efforts at hand drilling the progress was not one third of that accomplished at the east end where the Burleigh compressed air drills are used.

### Photographs of Arctic Scenery.

One of the most interesting and instructive entertainments of the season was given at the Somerville Art Gallery last week by Mr. Bradford. It is known that Mr. Bradford and Dr. Hayes revisited the polar regions in the summer of 1869, and that they brought back with them several hundred photographs and sketches of a region hitherto unknown to the world except by description. The photographs have been copied upon glass for exhibition with the magic lantern on a canvas 20 feet square. The pictures are remarkable for their sharpness and definition, and afford a better idea of that wonderful region than it would be possible to obtain without personal inspection. The interest of the occasion was greatly enhanced by the explanations made by Dr. Hayes, who courteously gave an account of the adventures of the party, with the necessary statistical and scientific information in reference to the size of the icebergs and the geological character of the rocks. We understood Dr. Hayes to say that there was enough ice in one of the floating masses so truthfully delineated upon the canvas, if brought to the New York market and sold at the price we are accustomed to pay, to bring in enough money to pay off our national debt and leave a balance in the treasury. This startling statement affords the best idea of the enormous weight of these icebergs, and we can better understand, after viewing them, how readily they can grind out valleys, and change the whole contour of the bed of the ocean in which they float. At the close of the exhibition Dr. Barnard, of Columbia College, made some eloquent remarks on the educational value of such studies and urged upon the Board of Education the importance of affording an opportunity to our school children of seeing representations of this entertaining and instructive character.

Mr. Bradford then invited the company to partake of some ices evidently not of arctic manufacture, and of edibles very different from the pemmican and blubber with which his traveling companions were obliged to be content in their northern journey. The entertainment was one to be remembered by all who had the pleasure of being present.

### New Projection of the Earth.

G. R. Nash, C. E., of North Adams, Mass, has calculated and constructed a new system of projections, which he designates "The Conoidal," on which linear position, area, angles, and distance, are in harmony, as also "form" when sectional maps are used. It seems to us better adapted for general purposes than any of the projections now used.

On 'Mercator's" projection, the young student of geography is at once misled respecting the comparative sizes, positions, and forms of countries, islands, seas, etc., resulting from its variable scale, and many persons carry these early impressions through life. "Mercator's" is a special projection for the use of mariners, and not suited for general purposes. The "Spherical" has three disadvantages: One that it is not a delineation of the earth's surface on one representation; another, that parallels of latitude are not parallel; and thirdly, it embraces more area than really exists. The new projection corrects these disqualifications in both projections, besides possessing other favorable features, and is, therefore, we believe, eminently qualified to be the basis for the future construction of maps, charts, and atlases. A great advantage is also apparent in the lines at right angles with each other, dividing the chart into squares, as any person can see at once the distances north and south, east and west of the equator, or prime meridian, or other points, thereby greatly assisting in teaching sizes and areas.

Charts showing only small subdivisions on this projection are necessarily very correct, and can be constructed with any meridian as a "prime."

We have seen a drawing on this projection, which represents the first map of an atlas. It is proposed next in order to project the New World, then the Old World, then each continent with its sectional maps, which arrangement would gradually reduce any distortion produced on a chart showing the whole surface of the earth.

### Lamy's Thermometer.

The pyrometer invented by Lamy is founded upon the dissociation of carbonic acid from calc spar in a porcelain tube, and an arrangement for reading the amount of gas thus expelled. He has since extended his experiments upon other salts and finds the double compound of ammonia chloride of calcium to be admirably adapted to the accurate determination of slight variations in temperature. This is in consequence of the ease with which the ammonia vapor can be expelled, and the variations in its tension under different degrees of heat. Lamy incloses about a gramme of the ammonia chloride of calcium (made by passing ammonia gas over dry chloride of calcium) in a flat copper box of the size of a five franc piece, with a tube 4 or 5 mm. wide and 150 millimeters long. This tube is attached to a leaden tube of 1·51 mm. diameter and of any required length, on the end of which is plaeed the manometer for reading the force of expansion of the gas. For lower temperatures a column of quicksilver will answer every purpose. As long tubes can be used this form of thermometer is admirably adapted for determining the temperature of wells and caves into which it can readily be sunk.

The subject is one of peculiar interest as affording more accurate methods for measuring small degrees of heat than can otherwise be obtained.

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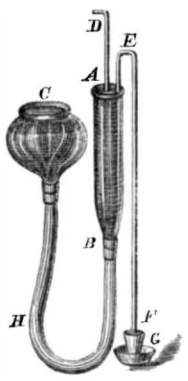
## MERCURIAL PUMP WITHOUT VALVES OR STOP-COCKS.

The *Journal of the Franklin Institute* is indebted to Prof. Young, of Dartmouth College, for an account of the following ingenious arrangement, which was first suggested by Mr. C. H. Smith, of Mt. Auburn Institute, Cincinnati, Ohio, to Prof. C. O. Thompson, of Worcester, Mass., and was by the latter gentleman carried out in practice with entire success.

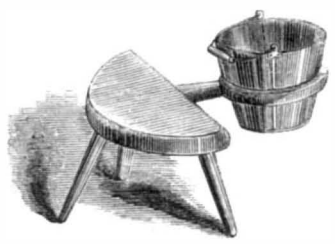
A glass tube, A B, of such size as may be desired, is drawn out at one end, B, and by means of a stout rubber tube is connected with a mercury reservoir, C. A rubber cork at the end, A, carries two tubes; one, D, leading from the vessel to be exhausted to the bottom of A B, the other from the top of A B to a beaker, G, containing a little mercury, the hight, F E, being about 30 inches.




When the reservoir, C, is raised, the mercury entering B C closes the lower end of the tube, D, and expels all the air contained in A B by the tube, E F, and, in fact, is allowed to fill and flow through E F for a moment. On depressing the reservoir the mercury descends in A B and leaves a vacuum into which air flows from D; E F being over 30 inches in hight, the mercury in F rises in it but no air can enter by that way. To render the joints at A tight, a little mercury is run in over the rubber cork, as was suggested by Dr. Gibbs, of Cambridge, in his modifications of Sprengel's pump.

## MILKING-STOOL AND PAIL-HOLDER.

L. B. Hoit, of Cedar Falls, Iowa, has invented an improved milking-stool and pail-holder, of which the accompanying engraving is a representation.



The object of this improvement is to hold the pail near the bag of the cow, so that the milk shall not be lost by spraying, as is the case when the pail rests upon the ground, to keep the pail from being soiled on the bottom by filth, and to obviate the fatigue of holding the pail on the knees.

The stool has attached an arm with a circular frame at the end to support the pail. The weight of the milker on the stool counterbalances that of the milk-pail.

By the use of this simple article, milk is saved, and also preserved from filth, the bucket is out of the way of the cow's tail, and she cannot kick it over. At the same time much fatigue is saved to the milker.

## IMPROVED MOP WRINGER.

This improvement is the invention of B. B. Choate, of Springfield, Vt., and its object is to save the hands from strain, as well as contact with filthy water in the wringing of floor mops.

A, in the accompanying engraving, represents two metallic bars, which are bent at their centers, in the line of their edges, nearly double, and then have their edges and sides curved or bent, in the manner represented in the drawing. These bars are pivoted together a short distance from their ends, and between their ends are placed the rollers C and D. The rollers have axles, which have bearings in the ends of the bars, holes being made in said bars for receiving the axles. The centers of the bars are so formed as to answer as foot pieces, upon which the operator may place his foot in bearing the rollers together. When the foot pieces at the centers of the bars are separated, the rollers, of course, separate at the same time, so that a mop may be placed between them. When the foot pieces are closed towards each other, the rollers close upon the mop, and press it as tightly as may be desirable for wringing the water, etc., from it.

The bars, A, are spread wide enough apart at a point just above their pivots that they embrace an ordinary water or mop pail on opposite sides, and are provided with hooks catching upon the edges of the pail, so as to support the bars and keep them in position. Upon one of the shafts of the rollers is secured a crank handle for revolving or giving motion to them.

The operator stands over the bucket and operates one of the bars with his foot, while he turns the rollers with his hand by means of the crank handle. One bar will remain stationary, while the other can be raised or lowered, so as to separate or close the rollers. The mop is pressed and drawn between the rollers in the usual manner.

## A NEW INK FOR PRINTERS.

In the official announcement of patents issued during the past week, published in another column, will be found that of a new printers' ink, which, while it is said that it can be furnished 33 per cent cheaper than the ordinary ink, is claimed to possess superior advantages to any hitherto used.

The patentee is Mr. Julius Kircher, a pupil of the celebrated chemist, Liebig.

The ink in question consists of 10 parts of hydrated peroxide of iron, 6 parts of hydrated protoxide of iron, and from 10 to 16 parts of varnish.

The two first-named ingredients are mixed in a moist state by stirring; 48 parts of water are then added; and the water being evaporated by boiling converts the mixture into a fine velvety black powder. This powder is washed and dried, and finally mixed with the varnish, the proportion of which varies in accordance with the desired quality of the ink.

The advantages claimed for this ink are that it never changes its color. It has no disagreeable odor; it is a fine glossy black; and, as above stated, is one third cheaper than ordinary ink.

The manufacture of this ink is shortly to be introduced into this country, the requisite machinery for the purpose being now *en route* from Europe.

We understand that the Austrian Government has adopted this ink on account of its permanent unchangeable quality for printing the Government documents.

The patent is owned jointly by L. Bamberger, J. Kircher, the inventor, and Leopold Mendelson, the originator of Mendelson's *Bank Note Reporter*, whose name appears in connection with the macaroni and vermicelli manufacture in another column.

We have before us a copy of an Austrian newspaper published at Vienna, printed with this ink, which presents an unexceptionable appearance.

Any information relative to this ink may be obtained by addressing Mr. Leopold Mendelson, 311 and 313 Avenue A, New York city.

## Triumphs of Science.

The second of the course of four lectures before the Young Men's Christian Association, in this city, on the "Triumphs of Science," was delivered on the evening of December 8th.

After a few introductory remarks, Professor Doremus said there was a class of men who claimed to have discovered the distance of most of the bright orbs in the firmament, as well as the sizes and weights of many of them. Now, how was this knowledge gained? It was generally known that we could measure the distance between two objects on this globe without actual measurement, simply by watching the angles which were made between the eye and the objects themselves. The same principle was applied by the astronomer to the sun and moon and other celestial objects. Some of the stars were so distant that they could only be measured by the time taken by a ray of light to travel from them to the earth, and, even judged by this standard, were so remote that light took hundreds of years to traverse the space between them and the eye of the astronomer who was gazing at them. When the distance was known the size also could be ascertained by a calculation founded on the diameter and distance of the object, but some stars were so remote that we could not correctly estimate their diameter, though we could form some idea of their grandeur by their comparative brilliancy.

The weight was discovered by ascertaining the power of attraction possessed by the different planets. Some might say that these were mere dreams of fancy. But, in truth, astronomical calculations and measurements were the only ones entitled to absolute credit. He was ashamed to say that there was only one State in the Union that had yet been correctly laid down on the map by astronomical observations, and that State, he was, as a New Yorker, sorry to say was Massachusetts.

At present the maps of this country were very inaccurate, in spite of the delicacy of the lines that were shown as dividing our various counties and States, and they must ever be inaccurate until verified by scientific tests and measurements He ought not, however, omit to state, further, that at neither of the colleges of the city was there an observatory, or any means provided for astronomical instruction.

In view of our wealth, was not that a great opprobrium to our city? Indeed, that melancholy fact was one reason why he believed professors ought to come forward and bring under popular notice the claims of science. New York gave freely to the right and the left in aid of religion, and he thought this reproach of her illiberality to science would not long be allowed to rest upon us.

The Professor then again returned to the discoveries made by means of spectrum analyses. The most common metal in the universe seemed to be sodium, for we found it everywhere all through the starry world, in the air and in the human body. An old inscription at Memphis said that the earth below showed what the planets above were like.

Our earth was but a burned up star, and its crust but a very fragmentary part of its bulk. We all know how terrible were earthquakes or the trembling of the earth's crust under the influence of some internal agitation. By an estimate he had made a few years ago, it appeared that no less than half a million of human beings and millions of other animals had been destroyed by earthquakes and volcanoes within the last two centuries. This showed the vigor of this internal force of the earth and the terrible condition under which we were living.

Dr. Doremus then gave a number of instances of remarkable sinkings and elevations of the earth's crust, which, compared to the entire bulk of the globe, was but as one to forty. He then proceeded to show the nature of the earth's crust and to trace the various modifications to which its surface has been subjected, especially in the relative arrangement of land and water. To the eye of the geologist the earth, as it existed at present, was the product of unalterable and benefi-cent laws which had slowly worked out conditions of climate and even of wind currents, in exact correspondence with the needs of the animated creation.

The lecture terminated with some brilliant experiments, showing the precision of the ratio in which the elements of matter combine.

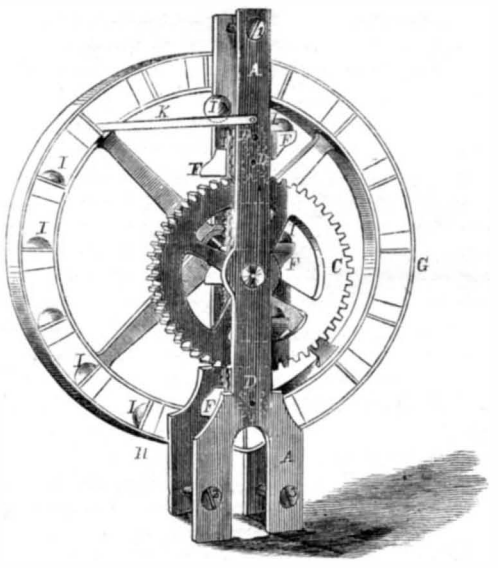
## PERPETUAL MOTION.

NUMBER IV.

In 1790 one Conradus Schwiers, a Doctor of Divinity, patented a "Machine on a self-moving principle, or perpetual motion." Fig. 7 is a view of this machine, which, it will be at once seen, is an effort since often repeated, to obtain a wheel so as to keep its center of gravity from ever falling directly under the axis while revolving. The following is the specification:

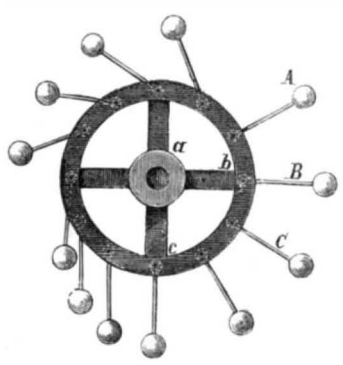
"Now know ye, that in obedience of the said letters patent, and the proviso therein contained, I, the said Conradus Schwiers, do hereby declare my said new invented self-moving principle, or perpetual motion, is made and performed in manner following, that is to say:

FIG. 7.




"Two stiles or uprights marked in the plan hereunto annexed, A, A, etc., and fastened together by the screws, 1, 2, 3, and to the base, between which stiles or uprights run the wheel, C, and the pinion, D, and the two double pinions, D, D, etc., over which double pinions run a douple chain, etc., to which chain are fixed the buckets, F, F, etc. The chain is made with joints on each side and bars running across, equal in number to the cogs of the wheel, C. Upon the same axle with the wheel, C, on the farther side of the inner stile, A, runs the wheel, G, whose diameter is full double that of the wheel, C; and the pivot of the wheel, G, runs in the back, H, as the other pivot of the same axle runs in the front stile, A. The wheel, G, is divided near the periphery into receptacles in number equal to the buckets on the chain, which receptacles are supplied with metal balls, I I, etc., from the buckets, F, F, etc., by means of the gutter, K, which balls by their weight forcing round the wheel, G, and thereby lifting up the buckets, F, F, etc., on one side as they go down on the other side, discharge themselves again at the bucket, L, where they are taken up by the buckets, F, F, etc., and discharged again at the gutter, K, and are so repeated in a constant succession as often as any receptacle is vacant in the wheel, G, at the gutter, K, for their reception, and by that means the perpetual revolution is obtained, the upper ball being at the same time discharged from one bucket when the lower ball is taken up by another." A very common principle has been worked out to uniform failure in various ways, from the earliest to the latest times. It is shown in the accompanying diagram, Fig. 8, which represents a large wheel, the circumference of which is furnished, at equal distances, with levers, each bearing at its extremity a weight, and movable on a hinge, so that in one direction they can rest upon the circumference, while on the opposite side, being carried away by the weight at the extremity, they are obliged to arrange themselves in the direction of the radius continued. This being supposed, it is evident that when the wheel turns in the direction, *a*, *b*, *c*, the weights, A, B, and C, will recede from the center; consequently, as they act with more force, they will carry the wheel towards that side; and as a new lever will be thrown out, in proportion as the wheel revolves, it thence follows, say they, that the wheel will continue to move in the same direction. But, notwithstanding the specious appearance of this reasoning, experience has proved that the machine will not go; and it may indeed be demonstrated that there is a certain position in which the center of gravity of all these weights is in the vertical plane passing through the point of suspension, and that therefore it must stop.

FIG. 8.




Fit companions to these remarkable specimens of false reasoning are the two modern devices of which we give illustrations in Figs. 9 and 10.

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Fig. 9 represents a device by Charles Batcheller, of Polk Co., Iowa, on which he has taken a patent during the present year.

"My invention is designed to provide a simple balance power, that may be advantageously used in connection with any machinery where a balance wheel or fly wheel is used or may be used. By my combination of levers, weights, and gearing, I create a compound power that is perfectly balanced when at rest. Thus far it is similar to a common fly wheel. But less force is required to put my compound wheel in motion, and, after being started, it accumulates a greater power, and much more rapidly, than an ordinary balance wheel. The degree of power actually gained has not been accurately determined. In addition to the increase of power I gain an increase of speed. While my compound balance-lever power makes one revolution, the inside shafts and wheels thereto attached make two revolutions. The illustration is a perspective view of my compound balance lever mounted on a frame. A is the frame. B represents pieces forming frames, in each of which are hung three geared wheels. There are two of these frames and two sets of those geared wheels. C is a geared wheel, which can be used for communicating power. D, belt wheels, which are also used to communicate power. These can be used at the same time, one on each side; and in place of the belt wheels and belting, geared wheels may be substituted. E represents weighted levers firmly secured to the axes of the geared wheels. There are four of these weighted levers, but only three shown in the illustration. G represents geared wheels secured on the hollow shafts, H, together with the frames, B. There are two of the geared wheels, and they are so placed that they connect the two sets of wheels and weights. By this connection the balancing power is formed. The frames, B, and the wheels, G, are secured upon the hollow shafts, so that they cannot move independent of each other. Shafts are placed within the hollow shafts, H, upon which the communicating wheels, D, and the center wheels are secured, so that they can move independent of the frames B, and wheels, G. While the frames, B, make one revolution, the wheels, D, and the center wheels, make two revolutions. This is caused by the action of the weighted levers, E. Their weight, or inertia, prevents them from passing around the center of the axis of the wheels with which they are suspended in the revolving frames. The full force of this resistance, or inertia, is applied to the other wheels of each set, and by these wheels communicated to the center wheel.

"The size and weight of this compoundbalance lever power may be varied and adapted to the various uses to which it may be applied."

FIG. 9.

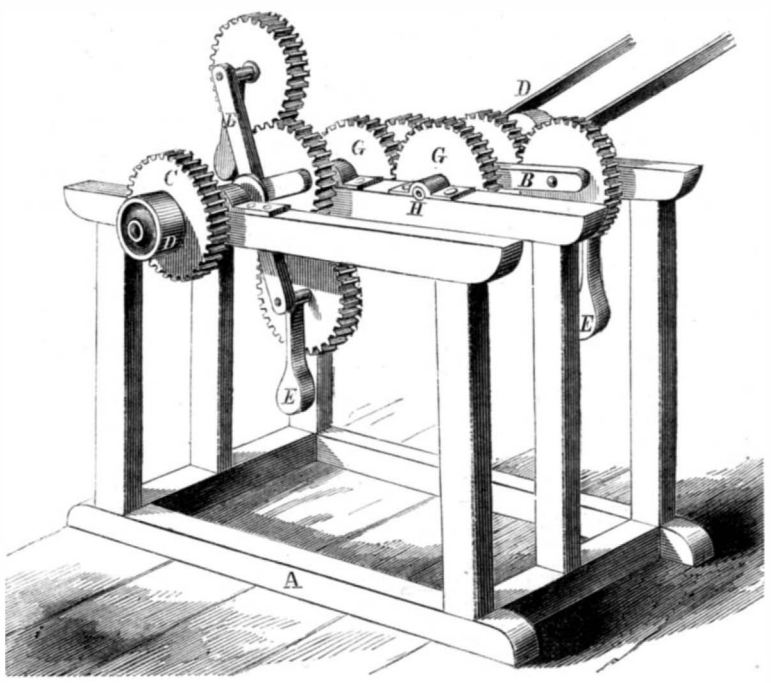
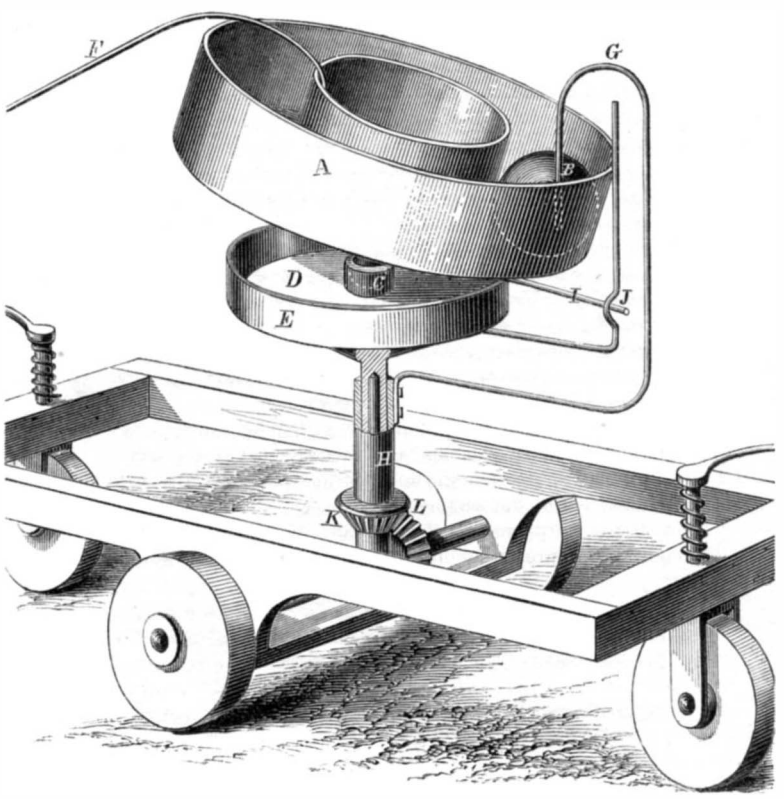



Fig. 10 is a device of Doctor Alois Drasch, of St. Egidi, Austria, patented in the United States, December 22, 1868.

"This invention consists in the arrangement of an annular tilting tray, which forms the orbit for a revolving ball, in combination with a supporting platform, and with a lever which extends into the tray and connects with a shaft, to which motion is to be imparted, in such a manner that, by continually changing the position of the tray, the ball is caused to rotate therein without interruption, and by the action of the rotating ball on the lever the desired motion is imparted to the shaft, which connects with the working machines or mechanism to be driven. A represents a tray, which forms an annular path, or orbit, for the ball, B. This tray is made of sheet metal, or any other suitable material, and its diameter is about four times that of the ball, B. It is supported in its center by a rod, which connects, by a ball and socket joint, C, with a platform, D, so that said tray can be readily tilted in any desired direction. From the edge of the platform, D, rises a circular rim, E, which prevents the tray from being tilted any lower than desirable. The position of the tray is governed by a hand-lever, F, which enables the operator to continually tilt said tray in advance of the rotating ball, so that said ball is kept rolling on a continually changing inclined plane; and, as the ball progresses in its orbit, it bears on a lever, G, which extends from the shaft, H, into the tray, as shown in the drawing. The tray is guided in its tilting motion by an arm, I, which is firmly attached to its circumference, and catches in a loop, J, secured to the edge of the platform, D. The shaft, H, is intended to transmit the motion, imparted to it by the action of the ball, B, to the working machines, or to a mechanism of any desired construction.

FIG. 10.




"In the drawing, my motor is shown as applied for propelling a railroad car, or vehicle, and in this case the shaft, H, bears a bevel wheel, K, which gears into a similar bevel wheel, L, mounted on the axle of the car, or vehicle, so that the rotary motion imparted to the shaft, F, will be transmitted to the axle of the car, or vehicle, and the desired motion of said car, or vehicle, will be effected. It is obvious, however, that my rotary ball-motor is applicable for the purpose of driving machinery of any kind, and it is particularly valuable in localities where the erection of a steam engine, or other motor, would be difficult or impracticable."

## Fly and Balance Wheels.

The fly wheel and the balance wheel, and their different uses and applications, the millwright should be familiar with. The fly wheel is used to equalize velocity; the balance to equalize weight.

When a crank is used as the medium of transmission between a rotary and reciprocating motion, in either direction, a fly wheel is generally necessary to equalize the momentum among the various situations of the crank during its revolution. The size and weight of the fly must, of course, be determined by the weight, and, more particularly, by the nature of the machinery. In many instances, this contains a sufficiency of regulating influences within itself, as the locomotive engine on a railroad, or the tread-power applied to drive a grindstone. The ordinary stationary steam engine, or a saw gate driven by gearing or by a belt, requires a fly wheel of a size and weight proportioned to the momemtum of the reciprocating movements. But a saw gate, or other reciprocating motion, taken direct from the water wheel by a crank on the same shaft, will run well enough with no other fly wheel than a balance; in fact, gates are often run in this way, without either fly or balance; but a balance should always be attached when circumstances admit of it, because, in addition to the assistance rendered by balancing the weight of the gate and pitman, another advantage is gained in the reduced strain and wear upon the binder and plumb block, by which the crank is much easier kept in its bearings. The rule among millwrights for the weight of the balance is to have its balancing power as near to that of the gate and pitman as possible; the extra weight of the saws, stirrup irons, and gages being found sufficient, with the advantage of gravity, to compensate the cut of the saws.

In computing this balancing power, regard must be had to the distance of each from the center; that is, the weight of gate, etc., must be calculated by the length of the crank from the center, while the weight of the balance must be calculated by the distance from its center of gravity to the same center, which is generally greater than the length of the crank. To make this plainer, suppose the crank to be twelve inches long, and the center of the balance eighteen inches from the center of the shaft, then every pound weight in the balance will be equal to one and a half on the crank.

For a light and swift crank motion, such as a screen or sieve in a grist mill, or the whiffers which take the rolls from a wool-carding machine at the doffer cylinder, springs are an excellent compensating medium.

There are many circumstances in which a fly wheel may be advantageously applied in a strictly rotary machine, either when the propelling power is unsteady or disturbed by other machines, or when the power is steady and the work of resistance is unequal, as in circular saws used for cutting fire-wood, making shingles and staves, or other work where the saw is alternately cutting and running empty at short intervals. By lengthening the arbor of such saws so as to place a fly wheel upon the end, at a convenient distance and out of the way, a great improvement may be made in their working, as it tends to equalize the velocity while the saw is running idle, and giving it out again while the saw is cutting. This effects a considerable saving of power, which is stored up, as it were, in a reservoir, and given out when required, thus enabling as light motive power and light belt to carry a saw through a cut which, without a fly wheel, would check up the saw, or slip the belt, and be ticklish and troublesome to feed.

It should be remembered here that the principle of the fly wheel is sometimes misunderstood and misapplied, as well as that of the lever, and that the fly wheel can never, under any circumstances, add power, but only equalize it. A machine may, therefore, be made with too much fly wheel. An instance of this will show what we mean. A friend of ours took a fancy for turning, and employed a good machinist to construct a crank power, to be worked by hand, to drive his lathe. The workman first set up a large shaft, with a crank on one end and a fly wheel on the other. The fly wheel was heavy enough for a ten-horse power engine, and a train of cog-wheels, ingeniously contrived to gain speed by an advantageous leverage without losing power, connected this first shaft with the cone-shaft from which the lathe belt got its motion. The result was that three men sweating on the crank gave the first shaft a motion like the shaft of an overshot wheel, and drove the lathe like a buz. But the men complained that the work was too heavy, and we were consulted to see if the work could be lightened. The result was that the great generator of power, the fly wheel, with its complicated train of cogged levers, was set aside, and a light band wheel upon the crank shaft substituted, from which the cone shaft was driven direct, and one man drove the machine with perfect ease and regularity.

Now, this blunder was not made by an inferior mechanic, as the workmanship of the various parts was excellent, but was the result of mistaken theories, most likely derived from a careless perusal of books, and jumping at conclusions which he had never enjoyed the opportunity of rectifying by experience. It may further be remarked here, as a general rule, that when a fly wheel is necessary to any revolving machine, it should be either upon or as near to the last and quickest mover as possible, and never, as in the case referred to, upon the first and slowest, where its effect is only to load and lumber the machine, and increase the friction without any compensating advantage.

We shall end this subject by a remark which we forgot to make when treating upon the sawmill crank-balance, which is, that the weight of the balance should never be more than the proportion there indicated, because the balance, though counteracted by the weight of gate and pitman, when up or down, has no compensating equivalent while acting horizontally, except the butt-end of the pitman, which leaves a great centrifugal force unbalanced, and acting alternately in both directions at each revolution, has an injurious effect upon the binder and bearings; and, further, that the balance and crank should be connected, and opposite each to the other, and not on separate parts of the shaft. A gang-shaft was broken where we were working, last winter, when no other cause could be assigned than that the balance was placed on the tail end of the shaft, which was thus, in addition to the strain of driving, made the medium of connection between the crank and balance, and it snapped off at the crank bearing.—*Craik's Practical Millwright and Miller*

## Tests for Glycerin.

We translate the following tests for glycerin from the *Chemischen Central Blatt* of Oct. 5, 1870:

"Brescius recommends as a test for glycerin, which is to be used in wines, beer, etc., to heat ten or twenty drops of the same in a platina capsule. It will commence to boil, then it will burn and leave a slight trace of carbonaceous substance, which will be but small when glycerin is distilled, while glycerin not distilled will leave considerable residue. This carbonaceous substance will disappear by being heated to a red heat, without leaving a perceptible white or other residue.

By adding the same volume of concentrated sulphuric acid, drop by drop, to a pure distilled glycerin, no color will appear, even after several hours. The vessel ought to be set in ice, and the sulphuric acid must be very carefully added to prevent heating of the mixture. Glycerin not distilled will, under these circumstances, take color, if only a very light shade. Any glycerin will take a brown color, by being heated with strong sulphuric acid, and it is for this reason especially

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necessary in this test to cool it off well. Pure distilled glycerin, to which are added a few drops of oxalate of ammonia, will not give, even after several hours, the slightest indications of cloudiness. Glycerin not distilled will, however, usually turn cloudy at once, or at least after a short while, if it does not form a precipitate. Pure glycerin, added to pure nitric acid, with a few drops of a solution of nitrate of silver, will not show the least cloudiness, while impure glycerin will always present a greater or lesser milky appearance. Above all it is to be observed that glycerin, even when shown in a large glass vessel, should be entirely colorless, and clear as water, and that it should not, by being warmed on the hand by rubbing, leave a fatty odor, which usually appears more prominent by adding a few drops of diluted acid, f. i. sulphuric acid.

### Drying of Wood.

Dr. Hartig, of Munich, has recently made experiments on various kinds of woods. He says trees generally contain, during the winter months, about an average of 50·7 per cent of moisture; in March and April, about 46·9 per cent; in May, June, and July, about 48 per cent; while up to the end of November the quantity of moisture increases but little. Air-dried wood (timber) contains from 20 to 25 per cent of water, and never less than 10 per cent. Wood, which by being artificially dried, has been deprived of all moisture, is thereby entirely altered as regards its cohesive strength—it becomes brittle, and loses its elasticity and flexibility.

In order to dry all kinds of timber by artificial means, so as to preserve the essential physical structure, and, thereby, the good properties of the wood, the drying should be effected slowly, and the temperature to which the timber is submitted should be moderate to begin with, and care should be taken not to eliminate all the water.

The author enters into details, illustrated by engravings, on the best means of drying timber on a large scale, and states that small pieces of wood, such as are intented for joiners and furniture-makers, may be readily and efficiently dried by being placed in dry sand, and then heated to 100°. The sand acts in the manner of an absorber of the moisture, as well as a diffuser of the heat.

### Improvements in the New York City Hall Park.

Our friends who have visited our office in Park Row will recollect that it fronts directly upon the City Hall Park. Should their business again call them here they will find a great and agreeable change has been made in this hitherto ugly looking plat of city property. On the lower end towards the Battery the massive and substantial U. S. P. O. building is slowly rising. On the north side of the post-office a handsome avenue has been cut through from Park Row to Broadway, and a very substantial Belgian pavement has been laid upon it. The remainder of the Park has been paved with the Scharf asphaltic pavement, which makes one of the most beautiful road surfaces we have seen, and we hope it will prove durable. The spaces between the walks and drives are handsomely laid out, and trees, fountains, and urinals of pleasing design have been placed therein. From a thing of ugliness the Park has been transformed into one of beauty, and the general appearance of the immediate vicinity is much improved thereby.

THE scientific lectures before the American Institute, at the Academy of Music, are as follows: Tuesday evening, December 20, 1870, The Struggles of Science, by George B. Loring, M.D., of Salem, Mass; Tuesday evening, December 27, 1870, How We Stand and Walk, by Prof. Burt G. Wilder, of Cornell University, Ithaca, N. Y.; Friday evening, January 6, 1871, The Triumphs of Modern Surgery, by Prof. F. H. Hamilton, of Bellevue Hosp. Med. College, New York; Friday evening, January 20, 1871, On Water, by Prof. C. F. Chandler, of Columbia College, New York; Friday evening, January 27, 1871, On Tides and Tidal Currents, and their Effects upon Harbors, by J. E. Hilgard, of the U. S. Coast Survey, Washington, D. C.; Friday evening, February 3, 1871, On Light, by Henry Morton, President of Stevens Institute, Hoboken, N. J.

SINCE the halfpenny postal-cards have been introduced in England it appears that their anticipated advantages are not without inseparable inconveniences. Whatever is written on these cards can be read by any one through whose hands they pass, while a letter weighing half an ounce may be sent securely in an envelope, over the length and breadth of the British Isles, for a penny postage-stamp. The economizing patrons of the cards, however, in their endeavor to save a halfpenny and secure their communications from inquisitive eyes, are directing their attention to sympathetic inks; apparently forgetting that the employment of such inks entails expense and loss of time to both the sender and receiver, and completely frustrates the main object contemplated by the use of the cards—dispatch. This is not the first time in the world's history that the attempt to save a cent has resulted in losing a dollar.

ATTACHING ECCENTRICS TO SHAFTS.—Mr. A. Stewart, of the U. P. R. R., North Platte, Nebraska, writes us that the method of attaching eccentrics, recently described and illustrated in this journal, and communicated by Mr. Egbert P. Watson, is not the invention of Mr. T. G. Gorman, as stated. Mr. Stewart says he had drawings and patterns made for the same thing while foreman of the Springfield shops in 1868, but that he does not claim the device as his invention, having seen the same twenty years previous.

MORE than half of education is learning *how* to learn.

## Correspondence.

*The Editors are not responsible for the opinions expressed by their Correspondents.*

### Beet-Root Culture in New Mexico.

MESSRS. EDITORS:—I have for the last two years experimented on raising sugar beets, the genuine Silesian, from seed obtained from Silesia, and I believe that this part of the world cannot be surpassed in the quantity and quality of beets suitable for sugar. We have for more than two years seriously entertained the idea of establishing a beet-sugar factory in this territory, but times were so dull and money so scarce, that we have not yet been able to commence in earnest.

There are great inducements offered for a beet-root sugar factory in this territory. There is an enormous quantity of sugar used, and every pound of it is brought from the East; and sugar, at wholesale, sells here at $22 to $24 per sack (100 pounds).

The beets grow here in abundance, and are a never-failing crop with irrigation, and labor is cheap—we pay 50 cents and board, per day for labor. It is clear that a beet-root sugar factory would be a financial success under judicious management.

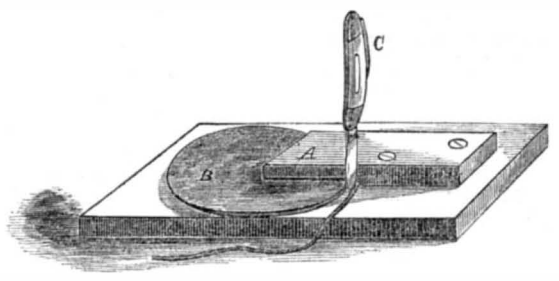
We have been stirring the matter from time to time in our local papers, and there is plenty of will, but not enough money. For instance, we here would do all as far as land and buildings are concerned—would furnish the beets, wood, coal, and even labor, if some party will furnish the capital to bring and set up the machinery. We have got splendid water power, good location, and plenty of land and wood.

We have got a fine woolen mill going, which we are just enlarging to a three-set mill, and shall have it in full operation again by next spring. CARL W. WILDENSTEIN.

Cherry Valley P. O., New Mexico.

### How to Make Leather Cord Belting.

MESSRS. EDITORS:—A. R. K. asks in "Queries," page 346, current volume, how to make a round leather cord belt. He can make one any length by cutting a perfectly circular piece of leather, then cutting it a little way round (two or three inches) with his knife to start it. Then take a piece of wood two and a half or three inches long, and cut a step in the under side like A in the diagram, and nail it to a board, the cut side down. Then put the leather under it like B, and stick a sharp knife down on the side towards him with the edge next the block about one tenth of an inch from the shoulder,




and draw the little piece that has been started through between the knife blade and the shoulder on the block, and he can draw it all out till he comes to the center of the leather. Then soak the leather in water a few minutes, and roll it between two boards after twisting it slightly.

Utica, N. Y. S. B.

### Conductivity of Various Substances.

MESSRS. EDITORS:—I notice in your paper an article by Richard Higgs, from the *Electric Telegraph and Railway Review*, in which he starts out with what seems to me false premises. He assumes that "experiment proves that the best heat conductors are the best conductors of electricity," and in support of this he inserts a table showing the relative conductivity of different metals, "by which," he says, "it will be seen that they generally agree as to order," but glass is not once spoken of. If I understand the matter at all, glass conducts heat rapidly, but shows a decided resistance to the passage of electricity. There are a number of substances in which as wide a divergence might be shown; the muscles of a living body, for instance, conduct electricity much better than heat. I am greatly mistaken if Mr. Higgs has not selected his facts to suit his theory, instead of suiting his theory to the facts—not an unusual practice in "these latter days." I do not claim to be much of an electrician myself, however, and should be pleased to hear from you or some of your readers who may be better acquainted with the subject.

Baltimore, Md. C. E. BENTLEY.

Our correspondent is mistaken in supposing glass a good conductor of heat. The art of glass blowing depends in a great measure upon its nonconductivity, which enables it to be heated in particular places and to retain its heat in those places without diffusing it to parts desired to retain their form and rigidity. Let our correspondent take a small piece of glass tubing and heat a spot in it to red heat in an alcohol or glass flame. He will find that he can hold the tube in his fingers only a very short distance from the heated portion. Then let him try the same experiment with a metal rod or tube, and he will find that he is laboring under a mistake.—EDS.

### Heating of Buildings.

MESSRS. EDITORS:—Permit me to remark that the practical man among your readers would disagree with you in your article on the "Heating of Buildings," page 359, on one point in particular, viz., that steam heating is the next best to grate fires. If you reconsider this matter, you cannot but confess that this is an error, as it is well known that warming buildings with circulation of the hot water apparatus is, if not equal to grates, the next best, as the most sensitive plant will thrive when cultivated under this heat; if with steam it would die. Hot water when well applied is economical steady, and healthy. J. B. M.

Montreal, Canada.

[Steam heat, *if properly applied*, is, we still think, for ordinary purposes, next to the grate in excellence, all things considered. It is true that for green-houses hot water apparatus is preferable; but for general heating purposes, low pressure steam, with air admitted from the external atmosphere, and passed directly through the heating coils, is more easily managed, we think, and less liable to prove inefficient under the care of such persons as are usually placed in charge of such apparatus.—EDS.

### Hoosac Tunnel.

MESSRS. EDITORS:—I was forcibly struck with the difficulties the practical engineer would have in establishing a line, or two points on the supposed line, at the bottom of the central shaft of the Hoosac Tunnel, described in your journal of October 29th, and as an engineer, would not be willing to trust to its correctness; but would insist that the corporation should sink another shaft not more than 3,000 feet or less than 500 feet (as the vertical contour of the ground might dictate) distant from the center shaft, to determine my accuracy. The difficulty, as all will agree, is in dropping two perpendiculars from two points in the tangent line on the surface to the bottom of the shaft, these points being necessarily less than 35 feet apart. I am at a loss, therefore, in endeavoring to obtain any information from your "San Jose, Cal.," correspondent, in your issue of No. 24, when he generalizes "that a reliable result can only be obtained by the aid of a transit instrument, modified according to the exigencies of position and surrounding circumstances." This sentence certainly "covers the ground," if, indeed, a better transit is needed than Queen, of Philadelphia, Temple, of Boston, and a host of other makers are making every day for civil engineers. But it does not seem to me that a transit is to overcome the difficulty that will be experienced. A perfect line is supposed to exist, or else certainly the shaft is not sunk on the line. This being the case, in what way will perpendiculars be dropped by the aid of a transit? One cannot see through the telescope of the transit down the shaft, and if he could he would not depend upon (to use a field engineer's expression) its "dumping" perfectly, no matter how perfect the transit might be in its mechanism. The objective difficulty is in dropping the perpendiculars. Can this be done perfectly, and a test of its perfection established? If so, the great difficulty is overcome. If not, I cannot conceive how a "transit instrument" can overcome it. Returning, however, to the plummet, not remembering the difficulties that have been experienced with long lines, I would suppose they were either the "vibratory-oscillating" or "vibrating rotative" motions. The attraction which would bring the lines closer together at the bottom than at the top of the shaft would affect only the length of the line, not its direction; and any motion of the earth which would affect the perpendicular of the lines, not vibratory in its character, would affect each line equally, and the line at the bottom of the shaft would be parallel, if not vertically identical, and so would practically be perfect. If, however, as I suppose, the difficulty is in either of the vibrating motions, I would suppose the hanging or suspending the plummet in oil would suffice. But I would still insist on another shaft being sunk, as before stated. The subject is an interesting one to engineers, and I would (for one) like to hear the views of the profession. By the way, Messrs. Editors, will you or the writers for your "Correspondence" column, give us the history of the Mount Cenis Tunnel in this same connection?

Clarksville, Tenn., G. C. BREED.

### Hoosac Tunnel.

MESSRS. EDITORS:—Your Californian correspondent, with the titles attached of A.M. and M.D., on page 372, current volume, contends "that the plummet cannot be depended on to give a vertical line for a central shaft to the tunnel, in consequence of the earth's rotation, which causes a deviation to the west, in geometrical progression, with the depth."

The earth's rotation tends to a deviation in its own direction, or east, in the simple ratio of the depth; but the tendency to deviate, for all practical purpose, is counteracted by the earth's constant central attraction.

We can, however, suppose an extreme case, when the plummet has descended under the influence of the eastern deviation, unrestricted by the central attraction, and its descent being arrested, the string would represent the rod of a pendulum, and the plummet would vibrate till the vibration was stopped, when it would rest on the true vertical line. The length of the tunnel is not recollected, but if it were 6 miles, or 3 miles each way from the center, a rise of 6 feet at the the ends above the center would be required to meet the spherosity of the earth. The tunnel is assumed to be straight, which would in effect be equal to a descent from each end towards the center. If the tunnel followed the arc, instead of the straight chord, its floor would be on a level throughout and vertical shafts from any part of the surface would enter it at right angles; whereas any vertical shaft to the straight tunnel would enter obliquely, except at the central point.

Pittsburgh, Pa. T. W. B.

A SERIES of experiments made with water and benzole, water and oil of cloves, water and sulphide of carbon, has been made, and shows that two liquids, not miscible with each other when in contact, boil at a lower temperature than when the most volatile of these liquids is brought to ebullition by itself.

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[For the Scientific American.]

## SUCCESSFUL APPLICATION OF STEAM TO CANAL BOATS.

BY T. MAIN.

In the winter of 1867–8, the writer, after considering various methods for applying steam for towing on the canals, conceived the plan of locating an ordinary screw propeller in the center of the bow of the ordinary canal boat, in a cavity or opening (tapering in shape, and terminating about 20 feet from the bow) which is formed for that purpose, with the view of preventing any agitation of the water, of displacing it at the bow, and of replacing it at the stern of the boat; and, in order to show the indications with this method of propulsion, a working model of a boat, and a section of the canal, on a scale of ½ inch to a foot, were constructed and tried in the spring of 1868.

Various models and experiments were tried until September, 1870, when the canal boat *Geo. Barnard* (a lake boat, 90 feet × 17 feet × 6 feet draft, and which carries 200 tuns) was procured, and steam power applied on this plan, at Nyack, for the purpose of making an actual trial on the Erie canal, to test the speed, the consumption of fuel, and to find whether there were any objections to its working when going through the locks, and running on the canal. Accordingly, on November 4th, after everything had been made ready, the *Geo. Barnard* left Nyack on a trial trip to Schenectady (on the Erie canal) and back, a distance of over three hundred miles, going with her own steam all the way.

The results of this trial prove that steam can be applied to ordinary canal boats to propel them three miles an hour, or twice the speed of the present loaded boats, without any injurious action on the canal banks whatever.

That the speed of the boat is the same on the canal as on the river.

That the boat can go through a lock in six minutes from the time the bow enters until the stern leaves it, or about one half the time a loaded horse boat takes; for, owing to the screw being in the bow, when going up the boat can be drawn against the upper gate, against the current, allowing the lower gate to be promptly closed.

That the boat will pass over the tow lines of other boats.

That it can be handled in the locks by three hands.

That a loaded boat can be run 72 miles per day, on one tun of coal, costing $5, while the towing for horse boats has cost 40 cents per mile this season, or $28·80 for 72 miles, and they take two days to go that distance, and have to pay the crew for two days instead of one.

That, if desired, this boat will tow one or more loaded boats at a moderate speed. (She towed a boat loaded with 135 tuns of cargo, at Rondout, at the rate of 2¾ miles an hour.)

That steam can be applied to any canal boat at a cost of about $600 for altering the boat, in addition to the cost of the machinery, and then she will be capable of doing twice as much business as before.

That such a boat can go on the canal, river, or lake, with her own steam, and so dispense with all charges for tunnage.

That steam can be advantageously applied to a canal boat or barge, with a smaller reduction of the carrying capacity, on this plan than on any other, as the boat can be built very full, and yet the water can flow to the screw, and go from it very readily.

That a boat carrying 200 tuns of cargo, on this plan, with a 16-horse power engine, and burning one tun of coal in twenty-four hours, will go three miles an hour, while the carrying capacity is only reduced ten tuns by the application of the machinery, and if a greater speed is desired it can be obtained by applying more power.

The steering qualities of the *Geo. Barnard*, when loaded on an even keel, are all that could be desired, and she behaved very well throughout the trip; the only thing found to be needed was a jet in the smoke pipe, so that the steam pressure could be maintained when cleaning the fire, or when the smoke pipe was lowered to go under the bridges.

The action of the engine and boiler was perfect, in fact the engine was never stopped until the destination of the boat was reached each day. The action of the screw on the trial has been found to draw a current into the opening at the bow, force it along under the bottom, and replace it at the stern, thus allowing the vessel to glide along without making any commotion in the water. The boat passed through forty-four locks on her way. She passed three loaded horse boats above Cohoes, and beat them three hours on a run of nine miles, thus showing that there is now no difficulty whatever in successfully applying steam to canal boats on the Erie, Champlain, or Hudson & Delaware canals.

### Alloys of Copper, Tin, Lead, Zinc, with Manganese.

In the year 1826 a spoon, made by Messrs. Zernecke, of Berlin, was analyzed, and the alloy was found to be composed of copper, 57·1 per cent; manganese, 19·7 per cent; zinc, 23·2 per cent. This analysis is included in a chapter on "Kuperfmangan," by Mr. Johann Tenner, in his "Handbuch der Metall-legirungen," published at Quedlinburg. Berthier produced a large number of alloys of manganese with various metals, and has recorded their principal properties. Although there is no published account of such experiments, Dr. Percy some years ago thoroughly investigated the nature of manganese alloys. There are also specifications of patents, one in the name of Emil Stoehr, dated 1862, the other in the name of Oscar Prieger, dated 1864, both claiming the original discovery of this class of alloy. Whilst, therefore, the alloys of copper, zinc, and other metals with manganese, have been more or less known to the metallurgist for more than forty years; whilst their valuable physical properties have been fully described; whilst, moreover, manganese in its ores almost approaches iron in its abundance and in its value, and whilst for years being suffered to escape as a waste product from almost every large alkali works, we find the metallurgist has not succeeded in reducing it to serve widely except when yoked with iron. Attention was directed to this subject by the late Mr. John Keates. To produce metallic manganese was not from the first attempted; and it is with extreme difficulty that even small quantities of this metal can be prepared. From the first it was discovered that in using any of the ores of manganese the iron and the silicon completely destroyed the value of the product. Having obtained a comparatively pure oxide of manganese, recovered from the "still-liquors," and having mixed this with oxide of copper, not metallic copper, together with wood charcoal, all finely ground and intimately mixed, the charge was put into a plumbago crucible, then heated in an air furnace at an intense heat from three to four hours. It was found when the pot was taken out that, still suspended in the charcoal, and not run down to the bottom, were innumerable fine shots of a bright white metal; these being separated by washing and placed again in the crucible and heated, fused into a prill or button covered with a layer of green vitreous slag. The process was continued, until some small ingots were produced, and on these experiments were made as to their malleability and ductility. The alloy was found to be very hard and brittle when hot, but when cold, although still hard, it rolled with ease, and was highly elastic. The proportions of the alloy were about—copper, 75 per cent; manganese, 25 per cent. When the simple alloy had been produced in sufficient quantities, compound alloys with zinc were tried in various proportions, and these again rolled with complete success. Certain mixtures of copper, zinc, and manganese possess the advantage over both German silver and yellow metal that, whereas the one will only roll cold, and the other hot, the manganese alloy rolls from hot to cold. The laboratory experiments having been completed, an air furnace was built in which a 1 cwt. plumbago crucible was used. The results were precisely the same as those obtained in the laboratory, only it was found that by stirring the charge a few minutes before the crucible was taken out of the fire, by far the greater portion of the metal that before was in small fine shot, needing very careful washing, now settled to the bottom of the pot, and could be poured out as a bar or an ingot, the slag also melting, and the unconsumed charcoal floating on the top. This experiment was continued until several hundredweights of the alloy were produced, so that it might be subjected to various tests, and also that some approximate estimate of its cost and value might be formed. As a simple alloy, in which the proportions of manganese range from 5 per cent to 30 per cent, it is both malleable and ductile, with a tenacity considerably greater than that of copper. With zinc, a compound alloy, resembling in some of its qualities German silver, is obtained. The alloy of copper and manganese combines with tin, lead, and other metals, and from these castings are made, and applied as bearings for machinery and other similar purposes. It was not the nature of the metal itself that prevented its being widely used; it was its cost. The waste of manganese is very considerable, over 10 per cent remaining unreduced, and forming a silicate; the wear and tear of the plumbago pots and the furnace incurred a large expense, and in proportion to the quantity of metal produced the fuel consumed and the labor expended were great. The work was therefore for a time arrested by an obstacle which not unfrequently bars the path of the inventor. It was, however, now simply a question of cost. The waste of manganese in alloys rich in that metal will, it is feared, always be considerable, but the value of the raw material would permit some such loss, could the other points be obtained—and these, it is believed have now been achieved. The metal has been produced by heating a mixture of carbonate of manganese with oxide of copper and charcoal in a tolerably large reverberatory furnace, and not in a small and costly pot. The fuel used has been principally the common slack or small coal of the district, and not coke. The labor has been proportionately reduced, and a series of alloys are produced that ere long promise to play no unimportant part in the arts and manufactures. It is the excellent furnace arrangements of Mr. Siemens that have assisted in overcoming the difficulties at first encountered, by affording the intense heat needed, with a non-oxidizing flame, in a quiet atmosphere.

*Specimens exhibited.*—(1) Manganese and copper in various proportions, from 35 per cent to 5 per cent of manganese as ingot, sheet, and wire. (2) Copper, zinc, and manganese; also in different proportions, and in a variety of applications. (3) Copper, zinc, manganese, and tin; as ingots and as bearings. (4) Copper, manganese, and tin, in several different proportions; as bars. (5) Copper, manganese, and lead.—*J. F. Allen, Esq. F. C. S. Before the British Association.*

### There is an Under-Current.

It has long been known that a current is constantly flowing into the Mediterranean from the Black Sea, and from the Atlantic, besides the numerous rivers pouring in always abundantly, and the question has often been asked: How is it that the great Midland sea does not become over-full? The answer is: Because, while a surface-stream flows in through the Strait of Gibraltar, a stream deep down is constantly flowing out; and the existence of this under-current is said to have been proved by a captain, who sunk a basket of stones by a rope to a considerable depth, where, being acted upon by the strong stream, it towed the boat out against the surface-current. Nevertheless, the existence of the under-current has often been questioned. Dr. Carpenter, however, who has recently returned to England from a dredging-cruise in the Mediterrenean, states that he took much pains to investigate this question, and ascertained that the outflowing under-current does really exist.

## EYESIGHT AND THE MICROSCOPE.

[Condensed from an article in "Good Health," by Professor John Phin, New York.]

In using the microscope, I have found that the best system is that recommended by Dr. Carpenter. It is to alternate the use of the eyes, always keeping the unemployed eye open. But I feel confident that it is of no use to keep the unemployed eye open if it be made to stare at a dead-black surface. It is the exclusion of light from one eye, and the consequent unequal action of the visual organs, that is thus produced, that causes the mischief that we dread; and it matters not whether this unequal action be produced by covering the eye with the eyelid, or by excluding the light from it by other means—the result is the same. In making observations with the microscope, all extraneous light should be excluded from the eyes. Hence the value of a properly arranged shade. Such a shade, however, should consist of more than a mere flat sheet of pasteboard covered with velvet. It should have a perpendicular portion, rising up in front of the face, and cutting off all light except that which comes through the microscope. And now, having provided a shield of this kind, which, by the way, is easily made of pasteboard, blackened on the inside with dead-black varnish (made of alcohol, lamp-black, and a very little shellac), if we punch an inch hole at such a point that the unoccupied eye can see it in the same way that the other eye looks through the instrument, we will find that the fatigue experienced by that eye is vastly less than when it is exposed to the dead-black surface. A few trials will set at rest all questions on this head, and the change from light to darkness is easily made by simply slipping a piece of blackened paper or card over the hole.

With few exceptions, we use altogether too much light with the microscope. Where a full flood of light is passed through a transparent object, the finer points are apt to be "drowned" out entirely; and it is only by modifying the amount of light by means of the diaphragm, that we are enabled to make out the more delicate details. Hence it will be found that the use of the bull's-eye condenser, for concentrating the light on the mirror, and consequently augmenting the amount of light passing through the object, is, in general, totally unnecessary. This arrangement of the illuminating apparatus is totally different in its effects from that of the achromatic condenser, and cannot be substituted for it, as some persons seem to think.

The first requisite in the light that we use is whiteness. Hence daylight, the light from a white cloud, the artificial white cloud illuminated by daylight, the light from the old-fashioned argand lamp burning sperm oil, the modern student lamp burning kerosene oil, and its various modifications, and the argand gas-burner are good—their excellence being about in the order here laid down. Common gas-light, candles, and kerosene lamps are inferior just about in the order we have named. White light is not nearly so fatiguing to the eyes as the reddish glare from a half-smothered combustion. Hence, in all cases we must seek to have the most perfect combustion and highest possible temperature of flame in our sources of artificial light. It is true that this gives rise to great heat, but this difficulty is easily obviated by the use of a proper screen or shade, and none will be found better than the one previously described. Indeed, when working by artificial light, it will be found that the heat is one of the most efficient causes of injury to the eyes, and the screen that we have mentioned is, perhaps, quite as useful, from the fact that it cuts off heat, as from its excluding unnecessary light.

The second requisite is steadiness. Nothing is more trying to the eyes than a flickering light. Of all sources of light, the naked gas-flame is the most unsteady; and yet we have seen young men working away with it for hours. The argand gas-lamp with glass chimney is much more steady, but it is not quite as white as a well-trimmed German student-lamp, burning good kerosene oil; and as this means of illumination is the most accessible in this country, it is probably to be preferred above all others.

There are certain conditions of nearly equal importance that ought to be found in the microscope itself, and that are found in the instruments of the best foreign makers, as well as those of this country. A very trifling want of correct adjustment on the part of the microscope produces a very injurious strain. Hence the necessity of a ready means of producing a delicate and accurate adjustment of the focus of the microscope. This is totally wanting in some instruments, and within a few days we saw, in an English scientific periodical, an advertisement of a microscope which claims superiority on the ground that it does not require focusing. Such a microscope must be essentially bad, except for a very limited class of objects. All good microscopes are furnished with arrangements for focusing. A second requisite is that the instrument should be so steady that the object shall be retained in view and in focus without change. Any tremor is injurious to the eyes, and especially is this the case when that tremor produce a continual change in the relation of the object to the focus. A single hour's work with a lens held in the hand or mounted on an unsteady stand will cause more injury to the eyes than weeks of work where a first-class instrument of far higher power is used. It has always seemed to us that watchmakers, engravers, and those who use lenses, do not sufficiently appreciate this fact. They in general mount their lenses on wire stands, which tremblingly respond to every footstep that falls upon the floor, and thus cause continual demands upon the eye for re-adjustment of focus. Wherever a microscope—single or compound—is used for more than a few seconds, it ought to be mounted upon a stand so firm that all vibration, and especially all disturbance of the focusing, will be avoided.

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### Shaw's Cotton Seed Huller.

The proper hulling of cotton seed is a matter of much importance, in a commercial point of view. Our readers having perused the valuable articles on Cotton Seed and Cotton Seed Oil, published in this journal during the past year, will stand in little need of any argument on this point. If the seed be much broken in the hulling process, so as to approximate the quality of meal, its spoiling during exportation is almost certain. We have been shown a letter, from a London firm, attesting that a lot of seed, hulled by the machine shown in our engraving, was shipped to London from this country, not only arriving in perfect condition, but yielding 42 lbs. of oil from 165 lbs. of seed, in the samples tested, the oil being of excellent quality, not inferior to that extracted from Egyptian seed.

In an agricultural point of view, the proper and economical hulling of the seed is also of importance, since the hulls which are worthless for industrial purposes, or for feeding contain nearly all the fertilizing elements of the seed.

We are informed that since the shipment of seed to London above referred to, other lots have been sent with equal success. If these are facts, as stated, they establish the possibility of shipping hulled seed, and will undoubtedly open the door to a large foreign traffic in this article.

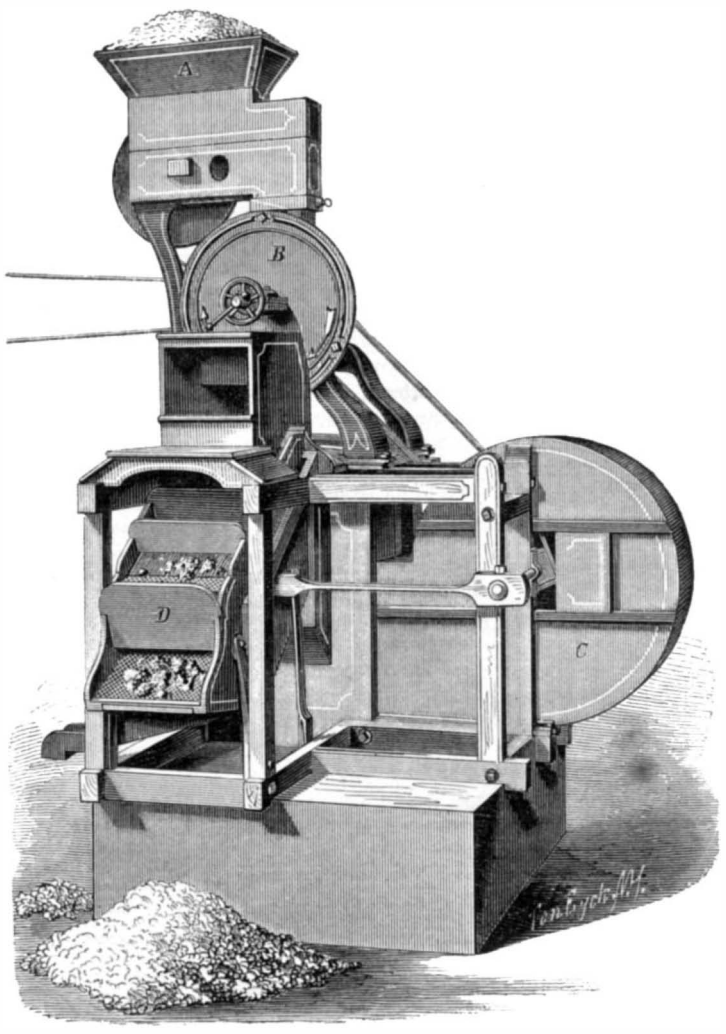
The operation of the machine is extremely simple, as is also its construction.

The seed is placed in the hopper, A. From this hopper it falls upon an endless apron, which carries it along and drops it into a vertical chute, from whence it is carried by a screw conveyer through the center openings of two revolving chilled iron plates, inclosed in the case, B, and passed through between their surfaces to be hulled. These hulling plates have a peculiar "dress," the action of which is to decorticate the kernels of the seed.

The seed, passing downward from the hulling plates, meets a blast, generated by the fan-blower, C, which blast carries up all such seed as is imperfectly hulled, together with the perfectly separated hulls, and deposits them upon the "separators," D. These separators are screens, upon which a series of fingers play, rubbing the imperfectly separated seeds and hulls, and completing the work of the hulling plates.

Very little of the seed is thus imperfectly hulled by the plates, and the passage of the same through the separators completely supplements the operation of the plates. At the same time the air blast removes all dust, and also acts to dry the hulled seed. A second separator in the opposite side of the machine from D separates the small portion of seed that may have been crushed in passing through the hulling plates, the crushed portion being used as food for cattle, while the sound and comparatively uncracked portions, constituting the greater bulk of the product, are reserved for exportation, or for home oil manufactories.

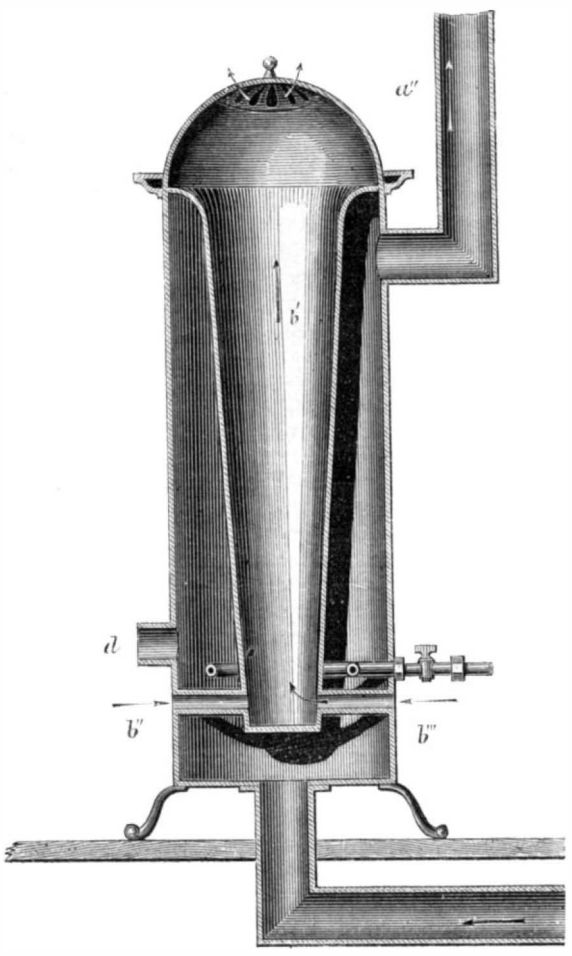
Patented Nov. 9, 1869, and June 7, 1870. For information concerning these machines address Jewell & Ehlen, 93 Liberty street, New York city.




SHAW'S COTTON SEED HULLER.

### Gas Stove.

A correspondent of the *Journal of Gas-Lighting* (London)




gives a description of a gas stove, which is not open to the objections against such stoves as they are usually constructed. It may be easily made anywhere by ordinary sheet-iron workers, and as such a stove would be in many cases very desirable, we reproduce the engraving of it from the journal referred to.

*a'*, the air-passage (2-inch tubing), passing underneath the floor to the outside of the building, and protected by an air-brick.

*a''*, the exit-flue. With a view to the economization of heat, this may be considered as part of the stove. As much of it as may be convenient should, therefore, be fixed in the room.

*b'*, an air-chamber, through which the air circulates, entering below through the tubes, *b''*, *b'''*. *c*, the ring-burner.

*d*, a circular doorway for lighting the gas and examining the hight of the jets. This is closed by a disk of glass set in a tight-fitting ring, fastened by a bayonet-joint.

The exit-flue may extend horizontally a considerable distance—say 30 to 50 feet—if within such limits it can be conveyed into a constantly-used chimney, or, in any case, one with a good up-draft. If no chimney be available, the flue may be carried (horizontally) any reasonable distance to the outside of the building, the end being turned up in the usual manner. By a slight alteration in the fitting up—that is, by connecting the air-tubes, *b''*, *b'''*—so as to receive air from outside the house, a constant flow of fresh (warmed) air would be admitted to the room.

### Rapid Telegraphing.

There was great rivalry between the Western Union and the other telegraph companies having lines between this city and Washington, D. C., as to which should transmit most rapidly the annual message of the President, delivered to the Senate and House of Representatives on December 5th. The message contained about 9,000 words, and was transmitted over 10 wires by the Western Union Company, dropping copies at Baltimore and Philadelphia in 37½ minutes, or at the average rate of 25 words per minute on each wire.

The entire message was transmitted by the Bankers and Brokers' and Franklin Companies in 70 minutes, employing two wires each. This was at the rate of 33 words per minute.

The Franklin Company used two wires until the message was completed, and a third wire for 15 minutes, the average time being 70 minutes, and the average speed 28 words per minute.

The Bankers and Brokers' Company used two wires, the average time being 70 minutes, and the average speed 35 words per minute. One of these wires averaged 39 words per minute—Mr. Benjamin Johnson sending and Mr. I. S. Fitch receiving.

The result in the strike in January last drove from the Western Union to the opposition companies, greatly to the advantage of the latter, some of the best operators formerly employed by the former. The operators of the B. & B., and Franklin lines may justly feel proud of this achievement and their substantial demonstration of superiority.—*The Telegrapher.*

### The Mode of Erecting a Railway Bridge across the Ganges.

Last month a party of engineers, headed by Sir John Rennie, visited the works of Messrs. Campbell, Johnstone & Co., at Silvertown, to witness the exhibition of a new method of launching girders or bridges without scaffolding. The structure which formed the subject of the experiment was two spans, each 110 feet in length, of a bridge which is to be erected across the Ganges at Cawnpore, and which will carry on the top surface the rails of the Oude and Rohilkund railway, and below, a good and substantial roadway for bullock trains or ordinary traffic. The bridge is to be formed of lattice tubular girders, the hight over all being ten feet eight inches, and the bullock road nine feet wide by eight high. The bridge, when complete, will consist of 23 spans each of 110 feet in length, resting upon cylindrical piers of brickwork, and the weight of materials in each will be about 75 tuns.

The method hitherto adopted for launching girders of these dimensions has been simple haulage by means of chains and pulleys, which has been attended with great loss of power, delay, and many other inconveniences. The mode adopted and devised by Messrs. Campbell, Johnstone & Co., avoids waste of power, has nothing to do with either chains or pulleys, and depends entirely upon direct propulsion. The span having been built up on the shore, rests at each end upon a series of ten wheels, which are propelled by ten hydraulic rams, five on each side; the number may of course be diminished or increased, according to the work to be performed—and to these wheels, which play upon a rail beneath the bridge, there is fitted a worm and worm-wheel moved by a ratchet brace, which is set in motion by five men on each side working handles up and down, who can propel 150 tuns at the rate of nine inches in the minute, a speed which, with a slight alteration of the machinery, will be increased to a foot. In this instance a bridge 2,530 feet in length, is to cross the Ganges in 23 spans of 110 feet each. Every section (each including two spans) will be launched from the same shore, and all will be driven across by the apparatus and moved from pier to pier as required. The bridge was designed by Mr. Heppel, C. E., and has been constructed by Messrs. Campbell, Johnstone & Co., to whom belong the entire credit of devising the apparatus for the fixture of the superstructure.—*Herapath's Journal.*

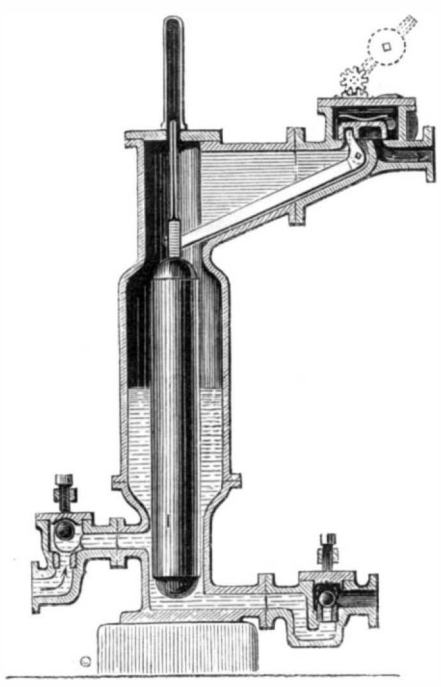
### Automatic Boiler Feeder.

This new feeder is the invention of the English enginee Mr. Macabies, and is designed to maintain a constant level in steam boilers. It is composed of a cylindrical receiver furnished with two spherical valves, one slide valve, and a floating water gage.

The receiver is put in communication first with the atmosphere and the hot water of a reservoir, and then with the steam and water of the generator.

It is in reality a supply cylinder of small capacity working automatically, and having no parts liable to derangement. The work of supplying the boiler is reduced to a simple surveillance of the apparatus.

According to the *English Mechanic*, when the float is down, as in the figure, the steam in the receiver can escape by the valve at the upper right hand corner, and hot water from the proper reservoir flows in by the valve at the lower left hand side. As the receiver fills, the float rises and closes the right hand upper valve; the steam, then acting upon the water of the receiver, closes the valve which admits the supply and opens the valve upon the opposite side, which communicates with the boiler. The water, being subjected to equal pressure above and below



flows into the boiler by virtue of its weight. The float descending with the water shuts the steam valve and the water again flows in.

Dyeing Articles made of Horn Black.—The objects made of horn, and ready for use, but not yet polished, are placed in a lye of caustic soda or potassa, and left therein until a portion of the surface has been dissolved, which may be readily detected by the somewhat fatty feeling the horn assumes when touched with the fingers. The objects are next washed in pure fresh water, and afterwards passed through Lucas' aniline black. After having been dried, the objects are washed, and, lastly, polished.

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## PROPRIETORS AND FOREMEN.

A mechanic writes us: "I must caution all mechanics against using their inventive genius, if they have such a boss as I have got, lest they on Saturday night get a note in their book, informing them that they are no longer wanted."

Proprietors of manufacturing establishments sometimes imagine that because they purchase the intelligent labor of their operatives, and grudgingly dole out, at the end of the week, its moderate wages, they can lay claim, or ought to lay claim, to the private brain work of the individuals so unfortunate as to be under their employ. We advise every mechanic, who has such an employer, to leave him as soon as he can find another situation, for he certainly cannot make a change for the worse.

But, while there may be *some* such employers, we are glad that our experience warrants us in saying that they are exceptional. The majority would be glad to see a talented operative working his way from the ranks, and would (so long as he does not neglect the duties for which he is paid), encourage, rather than discourage, any effort he might make to that end. Cases are not rare where young mechanics have added their inventions to the capital stock of the firms in which they were employed, and become partners. Mechanics should, however, remember that they have no right to use the time of their employers in the furtherance of their own private interests, and that they deserve not only rebuke, but discharge, should they, without the full knowledge and consent of their employers, surreptitiously make models, or drawings, instead of attending to their proper work.

In many cases, the power to employ, or discharge, is vested in a salaried foreman, possessing no direct interest in the business which he superintends. Whenever this is the case, proprietors should recollect that a foreman will "bear watching," as well as his subordinates. It is to our knowledge, not without precedent, that foremen take a leaf from the book of municipal management, and make a trade of indulgences to the workmen under them. In other words, they roll a bribe like a sweet morsel under their tongues, and the man who refuses to pay tribute finds, after a while, that he must make way for perhaps some inferior workman, having less self-respect, and more love for unrighteous mammon.

In general, we believe proprietors of large establishments are too careless of the personal welfare of their employés, and might secure better service, and advance their own interests, by seeing that justice is impartially administered by their foreman. No man ever yet lost any thing by showing his help that he had, at least, the regard for them which common humanity claims.

## HOW VERMICELLI AND MACARONI ARE MADE.

Macaroni and vermicelli are articles of food originally, we believe, prepared in Genoa, in Italy. The former is a dough of wheat flour and water, made into a pipe-like form, a little larger than the barrel of a goose quill, and dried till it is hard. The latter is a simple dough of wheat flour and water, or a mixture of flour, water, eggs, sugar, and saffron, made into threads, and dried like macaroni.

Except in a few small establishments, where the work has been generally performed by hand, the manufacture of these articles has not until recently been prosecuted in this country.

The Mendelson Vermicelli and Macaroni Works is an extensive steam manufactory of macaroni and vermicelli, recently established at Nos. 311 and 313, Avenue A, in this city.

Feeling that a description of the processes employed would be of interest to our readers, we this week visited the works mentioned, and were rewarded by witnessing for the first time a very interesting series of manipulations, which, though extremely simple, require for their conduct great care, skill, and experience, to secure uniformly good results.

The first step in the manufacture of these articles, is the preparation of the dough. This is done in machines strongly resembling pug-mills for mixing clay for brickmaking. The tempering of the dough is not done by any particular formula, the variations in the quality of the flour used not permitting the use of a particular specified quantity of water. The tempering is a work of great nicety, as upon it depends the perfection of the subsequent processes.

The dough taken from the mixers is put into a press, and compressed into cylinders about seven or eight inches in diameter, and from twelve to fourteen inches in length. These dough cylinders have considerable consistency. They may be handled without detriment to their shape, which exactly fits the cylinders of powerful hydraulic presses of peculiar construction. Into these cylinders the dough is placed, and pressed through holes in former plates at the bottom of the cylinders.

For macaroni, the holes in the former plates have each a plug which is supported from the inside, and which is enough smaller than the hole to leave an annular space all around it. Through this annular space the dough issues in the form of long tubes, which are removed, cut into proper lengths, and placed on trays formed of cloth of loose texture, stretched on square frames of a convenient size for handling. These trays are placed in frames in a darkened room, where they remain till the macaroni is fully dried.

Vermicelli goes through the same operations as macaroni, until it reaches the hydraulic presses. In these presses the former plates used for vermicelli are made with concentric groups of holes, each group containing about forty-eight holes, and each hole being about one tenth of an inch in diameter. When the pressure is applied the dough issues through these holes in threads resembling catgut in appearance almost exactly. The pressure to which it is submitted causes it to become heated; and to cool it and partially dry it, a blast of cold air is made to play directly upon it, a fan blower being used for this purpose. The operation is completed by cutting the condles of forty-eight threads into proper lengths, twisting the lengths up into graceful coils, drying, and packing.

We understand the concern is now working about twenty-five barrels of flour per day, with city orders for all they can produce.

Mr. L. Mendelson, the head of this establishment was the originator of the Mendelson Bank-Note Reporter, and is well known as one of the many German citizens who have brought with them to this country rare business talents and great commercial enterprise.

## CLOSE OF VOLUME XXIII.

The never-ceasing tide of time has brought us to the close of our twenty-third volume. The six months consumed in its publication have been months of steady progress and healthy growth, and have brought us many gratifying assurances that our efforts to please our patrons are successful and duly appreciated.

The contents of the volume are, we think, unprecedentedly rich and varied, and its numerous engravings maintain the standard of high excellence we have always sustained in this department.

The correspondence contains very much instructive practical matter, and constitutes a very valuable feature of the volume.

Towards the close of the volume we started a new feature, namely, a column of queries, wherein the information desired by our readers may be made known to practical men, and practical answers received from correspondents so situated as to be in possession of the information required. We think this column will call out a vast amount of practical information which will be placed at the disposal of all our readers.

Our miscellany has comprised the most instructive and popularly written articles on theoretical and practical subjects, obtainable from the best home and foreign sources, and the editorial articles have been written with a view to suggest thought, and to indicate the general current of progress in science and the arts.

That our efforts to keep ahead of all competitors in our peculiar field have been successful is indicated by the steady and healthy growth of our subscription list, and the unmistakable signs of satisfaction gathered from our extensive correspondence.

To the press at large, and our exchanges particularly, we are indebted for many favorable notices and warm commendations. Our articles have been extensively copied and credited, both at home and abroad.

We feel that we are justified in appealing to the friends of the SCIENTIFIC AMERICAN to aid us in increasing our circulation, and feel confident that the appeal will be responded to by a large accession of new subscribers for 1871.

Meanwhile we shall continue unabated our efforts to keep in the very front rank of popular scientific publications, and shall neglect no opportunity to add to the attractions, general interest, and value of our paper.

## REMOVING STREET SNOW AND ICE.

On some of our thoroughfares, where rival horse-railway companies have adjoining tracks, the efforts which they make to remove the snow is sometimes ludicrous, if not foolish. The great scraper of the Third Avenue Company, for example, will come along, sweeping the snow from its own track very nicely, but depositing it upon the track of its next neighbor, whose following machine chucks it back again where it came from. This sort of fun is sometimes kept up for a whole day; time and labor of man and beast are wasted; public travel obstructed, and the companies lose much money.

The draft of the large snow scrapers is very heavy, and quite ruinous to the health of the horses. We have seen the vapor of perspiration from some of the twelve-horse teams rise above the third-story window of our office, after the efforts of the poor animals to drag the machine.

The companies ought to join hands, and wholly remove the snow from all crowded places, either by carting or melting.

By the practice of a little common-sense and ingenuity it would be easy to clear, and keep clear the tracks throughout the whole length of every city line. The aggregate loss of the various companies from snow obstructions is enormous. On some occasions all travel is suspended, and the entire forces of men and animals, with extra laborers, are employed to dig the snow; but as it is not removed, the rails are soon again covered.

There is a grand opportunity for an ingenious person to make a fortune by the invention of an effective machine for doing the above work.

On Broadway they employ to clear the gutters, snow scrapers, consisting of planks set on edge, diagonally to the line of draft. Eight horses drag the machine along, and they succeed in throwing up a portion of the snow into a windrow, and temporarily cleaning the gutter. But the immense travel of vehicles soon rolls the snow back again.

The best method is to remove the snow altogether; and probably the best way to do that, is by the application of steam.

In London they employ old steam fire engines for this purpose. The snow is scraped up into great heaps near the sewer openings, and jets of steam are then applied, by which the mass is quickly melted, and disappears through the sewers. This is a very speedy and effective method of getting rid of street snow and ice. We hope that our city authorities will give it a thorough trial this winter.

## SUCCESS AS THE MEASURE OF ABILITY.

The world usually accords the merit of ability to those who achieve success in any field of effort, and it is right. Success *is* the evidence of ability—ability to succeed—nothing more. Real mental caliber is not evidenced by success, unless that success is attained in some occupation or profession which requires great mental ability for its conduct.

A man may succeed in wearing a very small pair of boots, if his understanding is sufficiently narrow; and men succeed as often through deficiencies as through proficiencies. A man sits daily in front of the *Tribune* office in this city who makes a living by whittling with his feet. This man has no arms and has by long practice acquired the power to hold a piece of wood with the toes of one foot, while he whittles with a knife held in the toes of the other foot. It is quite doubtful judging from the appearance of this individual, whether, had he been endowed with arms, he would have achieved either the notoriety he now enjoys, or have made half the money he now pockets from the wonder-loving groups who gather about him. Such success as he has attained has been won through virtue of his deficiencies.

We recollect reading some years ago an account of a wonderful dancer whose chief attraction was that he had but one leg. With this leg he did what single legs had been deemed incapable of doing, and though his dancing fell short of a first-class two-legged performance, yet it was really wonderful for one leg, and so one leg drew houses where probably two would have failed to please the public.

As with physical defects so with mental. The piano playing of the blind negro idiot (?) "Tom," whose performance is certainly wonderful for a blind idiot, would lose a great portion of its charm if he were once understood to be in full possession of the intellect allotted to ordinary mortals. He succeeds in making a great impression because he has, or is supposed to have, two great defects.

It often is the case, on the other hand, that men fail because they have minds too large for their business. These minds will be, *must be*, occupied with higher things than the trivial details of business, and the petty cares, to neglect which is to insure failure in most commonplace vocations.

Success, then, unless measured by the character of the field in which it is achieved, is no measure of mental or physical power. Is a man successful? In what is he successful? Is he a successful dandy like Beau Brummel; a successful knave like a modern railroad grabber well known in this metropolis; a successful dry-goods clerk; or a successful lawyer and statesman, like Clay and Webster; a successful divine, like Whately; or a successful teacher, like Arnold?

Success is, it is true, a measure of ability, but of *great* ability only when it is itself tested by the higher measure of lofty aims, wise purposes, and good deeds.

## THE RELATION OF MINERALOGY TO CHEMISTRY.

It is related of the famous Abbe Hüay that while examining a fine specimen of calc spar on one occasion, he accidentally let it fall, and it broke into a hundred pieces. He was horrified at his carelessness, and, after making due apology, began to gather up the fragments. He soon observed that every piece had the same shape, and that the calc spar was made up of an infinite number of rhombic crystals. This circumstance led to the examination of many other minerals, and the result was the foundation of crystallography, and the

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reference of all crystalline substances back to six primitive forms. The science of crystals soon commanded the attention of chemists, and an instrument was invented, called the goniometer, for measuring the angles, and for deciding to what class each mineral belonged.

Later researches seem to point out that there is an intimate relation existing between the crystalline form and the composition of a body, and we may some day discover the law by which we can arrive at the composition of a mineral or other salt, by measuring its angles, and without the necessity of subjecting it to analysis. But this is at present mere speculation.

The peculiar luster, cleavage, hardness, and other physical properties of minerals, have been studied, and something like an independent science has been established, founded upon these external properties. As our knowledge of chemistry has increased, and better methods of analysis have been invented, we are ceasing to lay so much stress upon the outward forms of minerals, and have commenced arranging them with reference to the bases and acids they may contain. Chemists have found that all minerals are composed of well-known elements combined according to the laws of atomic weights, and that they are in every sense chemical salts. For example, feldspar is a double silicate of potash and alumina, and can be made in the blast furnace and porcelain oven as readily as chloride of sodium or saltpeter in the laboratory. Calc spar and arragonite can be made, the one from cold, the other from hot solutions. Every year witnesses the artificial manufacture of minerals, and there is a fair prospect of our ultimately being able to make every stone there is on the earth.

The time does not appear to be very far distant when we shall make even the precious stones, the diamond, the ruby, or the emerald, as readily as we now do glass and porcelain. Professor Dana, in his unsurpassed book on mineralogy, gives the formula of all minerals so far as is known, and classifies them according to their chemical constitution, and thus virtually hands the science over to the chemist. It was not until minerals were made artificially that we were able to form a rational theory of their probable origin in the rocks. Nature's laboratory does not differ from man's inferior imitation, and as the laws of combination are constant, it is safe to infer that the same agencies were employed in producing the native minerals that we pursue in making them artificially. It is only when we treat minerals as true chemical salts that we can assign them their proper place in the universe.

In a recent German work on chemistry, by Professor Geuther, of Jena, we find a tolerably full list of chemical compounds, and among them a large number that occur native, and are known as minerals; for example, under magnesium, potassium-magnesium chloride is described as carnallite; calcium-magnesium chloride as tachhydrite; calcium-magnesium carbonate, as dolomite; calcium-magnesium silicate, as augite, and so on through a long catalogue of substances. The crystalline form, solubility, hardness, specific gravity, general properties, and formulas of all salts are given with the occasional observation that this or that compound is found in nature as a mineral, but without any break in the order of discussion on account of that fact.

In this way mineralogy becomes incorporated with chemistry, and rocks may be defined to be chemical compounds that occur ready made in nature, just as carbonaceous substances are traced back to living organisms, and are treated of under the head of organic chemistry. It would not occur to any one to bottle up gases and to regard them as entitled to found a separate science, or to speak of metals, gases, or liquids as we do of chemistry and physics. Gases are a part of chemistry, and so are metals and minerals.

We have called attention to this subject in order to afford our readers some knowledge of the great progress made in the extent of our acquaintance with the crust of the earth, and of the formation of minerals, since chemistry was impressed into the service of explaining the nature of the forces that must have been at work to produce what we see around us. It was not until the acid character of silica was made known by Berzelius that we were able to manufacture glass in a rational and scientific manner, and glass is in fact an artificial mineral very much like what we find ready made in volcanic craters.

The manufacture of porcelain, of soluble glass, of saltpeter, and of many other useful compounds, is conducted in imitation of what is going on in nature, and is now founded upon strictly scientific principles. The total number of minerals thus far described does not exceed 700, while the different salts of potash alone amount to nearly as many, so that the study of potash in all of its relations involves nearly as much labor as the examination of all the minerals that have thus far been found. It will thus appear that the relation of mineralogy to chemistry is of the most intimate character, and that minerals can only be studied philosophically when regarded as chemical salts.

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AGRICULTURAL pursuits are beginning to absorb the attention and energies of the population of Colorado, which is favorable to the development of the resources of the territory. That prosperity which depends upon the hazards and uncertainties of mining is at best but spasmodic, and it is only where agriculture is made the fundamental interest that the population assumes a settled character and industry is attended by permanent rewards.

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## SCIENTIFIC AMERICAN.

## 1871.

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THOS. BLANCHARD,.....Inventor of Lathe for Irregular Forms.
WILLIAM T. G. MORTON,.....Inventor of Chloroform.
SAMUEL COLT,.....Inventor of Revolving Fire-Arms.
CHARLES GOODYEAR,.....Inventor of Rubber Fabrics.
FREDERICK E. SICKLES,.....Inventor of Steam Cut-Off.
HENRY BURDEN,.....Inventor of Horse-Shoe Machine.
JOHN ERICSSON,.....Inventor of the first Monitor.
JAMES BOGARDUS,.....Inventor of Iron Buildings.
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PETER COOPER,.....Inventor of Iron-Rolling Machinery.
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ISAIAH JENNINGS,.....Inventor of Friction Matches.
RICHARD M. HOE,.....Inventor of Fast Printing-Presses

These noble men, by their own efforts, raised themselves from the depths of poverty, and by their wonderful discoveries, conferred incalculable benefits upon the human race, entitling them to rank among its greatest benefactors. It is but fitting that the remembrance of their achievements, and the honored forms of their persons, as they lived and walked among us, should be perpetuated by the highest skill of art. The picture, which is three feet long and two feet high, forms an enduring and desirable object for the adornment of the parlor. It was engraved by the celebrated JOHN SARTAIN, from a large painting by SCHUSSELE, and all the portraits were taken from life. Every lover of Science and Progress should enjoy its possession. Single copies of the Engraving $9; Three copies, $25.

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**It is the intention** of the publishers of the SCIENTIFIC AMERICAN to make the paper next year better and handsomer than any previous year during the last quarter century it has been published.

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IN accordance with a long established rule, all subscriptions terminating with this volume will be discontinued at that time. We trust that all our subscribers will not only renew, but that they may find it convenient to induce some of their neighbors to join them. We intend to give our readers full measure and running over, in return for their money. That the publishers may calculate the quantity of paper to print on the new volume; and that none may be disappointed by not getting back numbers, we would impress upon all the importance of renewing their subscriptions and sending new names as early as possible.

### NEW BOOKS AND PUBLICATIONS.

THE CABIN ON THE PRAIRIE. By Rev. C. H. Pearson, Author of "Scenes in the West," etc. Illustrated. Boston: Lee & Shepard.

This is one of a series of stories called the "Frontier Series," now issuing by the above-named firm. It is a graphic picture of prairie life, full of varied stories, and to those unfamiliar with the scenes it delineates, unique incident. As a specimen of good healthy reading for youths of both sexes, it is unexcelled, while adults may peruse its instructive pages with pleasure and profit. The book is one calculated to secure a wide popularity.

MANUAL OF SOCIAL SCIENCE: Being a Condensation of the Principles of Social Science of H. C. Carey, LL.D. By KATE MCKEAN. Philadelphia: Henry Carey Baird, 406 Walnut street.

We shall in a future issue review his book editorially.

WE are indebted to the Hon. Horace Capron, U. S. Commissioner of Agriculture for a copy of his report for 1869. It contains a large mass of carefully compiled and valuable statistics, and many important papers on various subjects relating to American agriculture.


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## Recent American and Foreign Patents.

*Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.*

COMBINED LOCK AND LATCH.—F. M. Ranous, Yreka City, Cal.—This invention has for its object to improve the construction of an improved gate latch, patented October 26, 1869, and numbered 96,147, so as to make it more convenient in use, and more effective in operation, enabling it to be used as a lock without interfering with its operation as a latch.

SAFETY VALVE.—J. Armstrong, Brookfield, Missouri.—This invention relates to a new and useful improvement in safety valves for locomotive and other steam boilers.

ANIMAL TRAP.—Ebenezer Oliver, New York city.—This invention has for its object to improve the construction of the wire traps, known as round or bee-hive traps, so as to make them better adapted for use.

MODE OF SECURING SHIPS' ANCHORS.—William Henry Barker, Windsor, Nova Scotia.—The object of this invention is the construction of some simple apparatus, by which the anchor can be hung to the catheads and instantaneously let go when necessary, and avoiding all the principal objections to any of the machinery now in use for that purpose.

METHOD OF COUPLING PIPES.—George C. Germain, Cuyahoga Falls, Ohio.—The object of this invention is to so connect gas and water pipes, made of asphaltum or other suitable material, that the joints will be entirely water or gas proof, and readily applied.

CHAIR.—C. R. Long, Louisville, Ky.—This invention relates to a new and useful improvement in chairs, and consists in the mode of securing the seat to the legs, whereby the ordinary upper rounds and stretchers of the chairs are dispensed with, while the seat is made detachable, and the chair strong and durable.

WATER WHEEL.—Daniel W. Case, Garden City, Minn.—This invention relates to improvements in water wheels, and consists in the construction and arrangement of the bearing for the shaft, and adjusting apparatus therefor in the top of the case of the wheel; also, in certain improvements in the construction and arrangement of the chutes leading the water to the wheel and the gates therefor, and also in an arrangement for discharging the water from the wheel, partly through central and partly through vertical discharges.

CULTIVATOR.—Freeman C. Jewell, Rahway, N. J.—This invention has for its object to furnish an improved cultivator, simple in construction, easily operated, and effective in operation, and which shall be so constructed that it can be readily and quickly adjusted, as circumstances may require.

EXHAUST VALVE.—W. A. Carns, Malden, Mass.—The object of this invention is to prevent sparks and cinders from entering or being drawn into the cylinders of locomotive engines, when the motion is reversed.

WASHING MACHINE.—D. C. Harlow, Hannibal, Mo.—The object of this invention is to provide a simple and cheap apparatus to be used in connection with the common wash-tub for washing clothes, and consists in revolving a spring cylinder above a concave formed of rollers.

DRESSING AND FURROWING MILL-STONES.—James Lee Norton, London, England.—This invention has for its object improvements in apparatus for dressing and furrowing mill-stones.

CAR-COUPLING.—A. F. Street, Zanesville, Ohio.—This invention relates to a new and useful improvement in couplings for railroad cars, whereby strength, durability, and certainty of operation are secured.

SHOVEL PLOW.—Isaac A. Benedict, West Springfield, Pa.—This invention relates to a new and useful improvement in winged shovel plows, and consists in attaching the wings to adjustable arms and making the wings adjustable on the arms.

CLOCK-ALARM.—J. H. Davis, Chillicothe, Mo.—This invention has for its object to provide means whereby alarm attachments can, whenever desired, be secured to or connected with clocks of suitable construction. At present some clocks are provided with alarm attachments and others not. Those which have no attachments cannot, at present, be changed into alarm clocks. By the aid of this invention clocks of all kinds can be readily converted into alarm clocks, without the aid of experts.

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MILK CARRIER.—Lewis Morris, Havre de Grace, Md.—The object of this invention is to provide for public use a can in which milk may be transported from the farm to the city without deterioration in quality, from air or warmth, by the way. The can is constructed of material, which is a non-conductor of heat, with a lining of sheet metal, and is provided with a cover having a peculiar but simple and convenient device which admits of being sealed or locked, and also otherwise secured, without loss of time.

ANTI-FRICTION BOX FOR AXLES, SHAFTING, ETC.—William O. Reid, Vienna, N. C.—This invention consists in such an arrangement of friction balls with circumferential grooves in the internal surface of a pipe-box, that both the vertical and the longitudinal pressure (as between the axle journal and box) is received or borne by said balls, and the friction, and also the draft strain upon the team, thereby greatly lessened.

MACHINE FOR BENDING PLOW HANDLES.—Jacob Woodburn and S. F. Smith, Indianapolis, Ind.—This invention consists in an improved device for holding plow handles in the shape it is desired they shall have when attached to the plow, and in the peculiar construction of detaching parts, whereby the holding device may be quickly and easily attached to or disconnected from the machine for bending the handles. The whole apparatus is efficient without being expensive or cumbrous.

MACHINE FOR FINISHING PLOW HANDLES.—S. F. Smith, Indianapolis, Ind.—This invention consists in the arrangement of an ordinary sand polishing belt on two conical or round-faced pulleys—one larger than the other—so that said belt shall be caused to present a similar rounded surface, and in certain novel means of adjusting the tension of the belt and the angle of the smaller pulley thereto.

FAUCET.—Franz Wiesenhofer, Fremont, Ohio.—The object of this invention is to prevent flies and other insects from entering the lower ends of the hollow spigots used in certain kinds of faucets, and the consequent injury to the liquor drawn through such faucets.

BASE-BURNING STOVES.—Israel Snyder and Peter C. Garrett, Grand Rapids, Iowa.—This invention relates to improvements in base-burning stoves, and consists in making the fire-pot open at the sides from the grate up to the bottom of the reservoir with which it is connected; the said open fire-pot being used, and the draft being arranged to cause the flame and caloric currents to impinge against the outer shell of the cylinder as low down, and as directly as possible, the said arrangement provides a space between the cylinder and the fire-pot to the bottom of the stove for heating purposes.

BELT SPLICE POINT FINISHER.—John C. McLaren, Montreal, Canada.—This invention relates to an improved machine for cutting the ends of pieces of leather to be spliced for making belts, and it consists in a clamping apparatus for holding the strap and a cutter for cutting the end, both of peculiar construction, the object of which is to make a clean and smooth cut at the point reduced to a thin edge, which, as heretofore formed by the skarfing machine is left stringy and uneven.

CANCELING STAMP.—E. S. Goodman, New Orleans, La.—This invention relates to improvements in canceling stamps, and consists in providing the die with one or more plates having a number of sharp edges for cutting the articles to be stamped, and providing a thick leather bed on which the die strikes for the protection of the cutters. The said plates on which the cutters are formed, serve for guides for the ink-ribbon. The invention also comprises a novel arrangement of the type and the holding devices therefor to facilitate the chang ng of the type; also an arrangement of the type die for having the name and address of the inventor, maker, or other person sunk into the face alongside of the type for the date, so that an impression thereof will be given to the thing stamped at the same time.

VELOCIPEDE.—Henry A. Maltby, Brownsville, Texas.—This invention relates to improvements in velocipedes, and consists in a novel combination of foot and hand-propelling apparatus, also guiding apparatus, whereby the operators may employ both foot and hand simultaneously, and at the same time guide the machine by movements of the body actuating the guiding apparatus through the medium of the seat.

CHURN.—John W. Jordan, Lexington, Va.—This invention relates to improvements in churns, and consists in a vertically moving dasher, composed of one or more lazy-tongs frames, jointed at one end to the bottom of the churn case, and at the upper end to a vertically reciprocating rod worked by a lever or otherwise, so as to expand and contract the said frames, which have perforated boards so attached as to move up and down in the cream in a way to cause intense agitation.

WEAVING CERTAIN KINDS OF FABRICS.—Wm. Sam'l Laycock, Sheffield, England.—This improvement consists in fixing on each end of a shuttle a pair of nippers or other apparatus, one of which takes hold of the end of a single hair selected out of a bunch of hair on that side of the loom from which the shuttle commences to work. The shuttle is then driven through the shed by friction or otherwise, from under the shed, and when it reaches the opposite shuttle box it quits its hold of the hair it has drawn into the shed, and the nippers on the other side of the shuttle takes hold of another single hair selected out of a bunch from that side of the loom, so that in traversing back it deposits that hair in the shed, and the opposite nippers again seize another hair and proceed with it as before stated in the formation of the fabric.

CHAIN CLUTCH.—Hiram Pitcher, Fon du Lac, Wis.—This invention relates to a new and useful improvement in clutches for chain pulleys or wheels and windlasses, and for all purposes to which it is applicable, and it consists in a series of self-adjusting blocks, each with a recess for receiving and holding a chain, arranged in a groove around a wheel, drum, or windlass.

SPRINGS FOR CARRIAGES.—D. S. Abbott, Ischua, N. Y.—This invention relates to a new and useful improvement in springs for carriages, wagons, sulkies, and seats, and consists in a bar or spring so arranged that while the bar receives the weight or power, it is made to compress or operate upon an elastic spring, by means of which the required degree of elasticity is imparted to the carriage or wagon body or seat.

OILER FOR THE INTERIOR PARTS OF STEAM ENGINES.—Milan Hinman, West Stockbridge, Mass.—This invention has for its object to furnish an improved apparatus for introducing oil into the interior parts of an engine, oiling the throttle valve, governor valve, steam chest, cylinder, and other parts not usually oiled, preventing the wear of such parts, and which shall be simple in construction, easily applied, and effective in operation.

ANTI-FRICTION JOURNAL BOX OR BEARING.—James Wardrobe, C. D. B. Fisk, J. F. Curtis, and George Fetley, Carlin, Nevada.—This invention has for its object to furnish an improved anti-friction bearing for the journals of steam cars, horse cars, and other journals or shafts, which shall be simple in construction and effective in operation, being so constructed as to run for any required length of time without heating.

TYPE-SETTING MACHINE.—W. S. Shipley, Jersey City, N. J.—This invention relates to a new machine for setting type into rows and columns ready for the printing press, and consists chiefly in the application of an air blast whereby the types are conveyed from the receiver to the form in which they are set up. The invention consists also in the use of sectional grooved receivers for holding the type in proper position for the blast. These receivers are rotating blocks operated by means of levers or pawls from a keyboard so that each block can be turned at will to carry its type to the blast channel, which is formed by the grooves of the said blocks.

IMPROVEMENT IN THE MANUFACTURE OF ALUM AND IN OBTAINING BY SUCH MANUFACTURE PRODUCTS APPLICABLE TO CERTAIN USEFUL PURPOSES.—Peter Spence, Newton Heath, Manchester, Great Britain.—This invention consists in the use of certain compounds of alumina and phosphoric acid, particularly, or such compounds of alumina, iron, and phosphoric acid at present obtained in the island of Rodondos, near Antigua, in the West Indies, and known under the name of Rodondo phosphate, and of minerals of similar composition obtained in other West India islands and other places.

TOOL CHEST.—G. F. Card, Piper City, Ill.—This invention relates to improvements in tool chests, and consists in an application to the cover of a chest of a seat and clamp, such as used by leather workers, in such a way that when the cover is raised and the chest opened, the whole constitutes a seat and bench of a convenient kind for such workers, and when closed, the tools being in the same places as when the workman is at work, will be packed ready for storage or transportation.

PISTON ROD PACKING.—William Hartley, Rockford, Ill.—This invention relates to improvements in piston rod packing, and consists in an arrangement of sectional metallic rings and binding screws in a hollow cylinder attached to the piston head, through which the rod works, the said arrangement being such that the rings will be caused to bear upon the piston and against the ends of the cylinder, to which they are neatly fitted and make steam-tight joints, while allowing the piston to vibrate laterally as much as may be necessary for any inaccuracy in the working of the rod.

# Official List of Patents.

## ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING DEC. 13, 1870.

*Reported Officially for the Scientific American.*

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109,993.—CARRIAGE SPRING.—David S. Abbott, Ischua, N. Y.
109,994.—PUMP PISTON.—J. D. Alvord (assignor to James Wilson), Bridgeport, Conn.
109,995.—HOLDER FOR SILK, ETC.—B. A. Armstrong, Jersey City, N. J., assignor to himself, J. P. Brainard, New Haven, Conn., and L. O. Smith, Philadelphia, Pa.
109,976.—SAFETY VALVE.—Jasper Armstrong, Brookfield, Mo.
109,997.—BRICK MACHINE.—J. M. Austin (assignor to Isaac Turner, Georgetown, Mo.
109,998.—CAT-HEAD ANCHOR STOPPER.—Wiliam H. Barker, Windsor, Nova Scotia.
109,999.—SHOVEL PLOW.—I. A. Benedict, West Springfield, Pa.
110,000.—LET-OFF AND TENSION MECHANISM FOR POWER-LOOMS.—E. B. Bigelow, Boston, Mass.
110,001.—CARPENTERS' VISE.—George F. Bissell, Oneonta, N. Y.
110,002.—SELF-LUBRICATING AXLE.—G. P. Blaisdell, North Easton, Mass.
110,003.—STEAM HEATER.—Edward Bourne, Pittsburgh, Pa.
110,004.—CLEANER AND GRINDER FOR CARDING MACHINES.—L. W. Boynton, Hartford, Conn.
110,005.—GAS LAMP.—J. H. Brown, New York, assignor to himself and C. E. Ball, Jamaica, N. Y.
110,006.—ADJUSTABLE SHACKLE FOR CARRIAGE SPRINGS.—John Bullard, North Hyde Park, Vt.
110,007.—TOOL-CHEST.—George F. Card, Piper City, Ill.
110,008.—EXHAUST VALVE.—William A. Carns, Malden, Mass.
110,009.—WATER WHEEL.—Daniel W. Case, Garden City, Minn.
110,010.—STAMPING MILL OR CRUSHER.—George F. Case (assignor to himself and Milan C. Bullock), Windsor, Vt.
110,011.—HAY AND COTTON PRESS—Nathan Chapman, Hopedale, Mass.
110,012.—WOVEN FRINGED FABRIC.—Peter Cocker (assignor to himself and W. I. McBride), Philadelphia, Pa.
110,013.—TABLE.—George J. Congle, Chipewa Falls, Wis.
110,014.—CORN CUTTER.—H. V. Corbett (assignor to George W. Amigh), Allendale, Mich.
110,015.—FEED REGULATOR.—Wm. T. H. Daniels, Belville, Ohio.
110,016.—ALARM ATTACHMENT FOR CLOCKS.—J. H. Davis, Chillicothe, Mo.
110,017.—COFFEE ROASTER.—Noah Davis, Boston, Mass.
110,018.—INKING APPARATUS FOR PRINTING PRESSES.—Fred. Otto Degener, Brooklyn, E. D., N. Y.
110,019.—LAND ROLLER.—George C. Dolph, West Andover, Ohio.
110,020.—HINGE.—Rudolf Drahota, Philadelphia, Pa.
110,021.—TRUMPET FOR SPINNING MACHINES.—Geo. Draper, Hopedale, Mass.
110,022.—ROTARY ENGINE.—Richard Dudgeon, New York city.
110,023.—MACHINE FOR MIXING THE MATERIALS TO FORM ARTIFICIAL STONE, ETC.—J. S. Elliott (assignor to "The Union Stone Company"), Boston, Mass.
110,024.—BREECH-LOADING FIRE-ARMS.—W. H. Elliot, New York city.
110,025.—MEDICAL COMPOUNDS AND APPARATUS FOR MAKING THE SAME.—Peter Fahrney, Chicago, Ill.
110,026.—DOOR-STOP.—Wm. H. Fahrney (assignor to himself and John Donaldson), Rockford, Ill.
110,027.—MANUFACTURE OF PAINTS.—F. W. Gerdes, Allegheny City, Pa.
110,028.—PIPE COUPLING.—G. C. Germain, Cuyahoga Falls, Ohio.
110,029.—MACHINE FOR MIXING "BATCH" FOR GLASS.—W. T. Gillinder, Philadelphia, Pa.
110,030.—MODE OF ATTACHING BOOT AND SHOE HEELS.—Benjamin Giroux, Chicago, Ill.
110,031.—HAND STAMP.—Edward S. Goodman, New Orleans, La.
110,032.—TYMPAN SHEET FOR PRINTING PRESSES.—John Gorman, Portland, Me.
110,033.—WASHING MACHINE.—Dewitt C. Harlow, Hannibal, Mo.
110,034.—DEVICE FOR DRIVING SEWING MACHINES.—A. W. Harris, Providence, R. I.
110,035.—PISTON-ROD PACKING.—William Hartley, Rockford, Ill.
110,036.—NAUTICAL ALARM.—John F. Haskins, Fitchurg, Mass.
110,037.—MODE OF ATTACHING COMPOSITION HEELS TO BOOTS AND SHOES.—C. H. Helms, Poughkeepsie, N. Y.
110,038.—CORE FOR CASTINGS.—John Herald, Unadilla, N. Y.
110,039.—CULINARY VESSEL.—R. M. Hermance, Troy, N. Y. Antedated December 1, 1870.
110,040.—LUBRICATOR.—Milan Hinman, West Stockbridge, Mass., assignor to himself and Robert M. Stone, Des Moines, Iowa.
110,041.—SEMI-ROTARY VALVE.—Josephus F. Holloway, Cleveland, Ohio.
110,042.—REFINING AND DECOLORIZING SIRUPS AND OTHER LIQUIDS, AND IN MATERIAL FOR THE SAME.—Duane Hull, Brooklyn, N. Y.
110,043.—BURGLAR-ALARM.—Marshall J. Hunt, Rising Sun, Md.
110,044.—STEAM-JET BOILER-TUBE CLEANER.—Roland C. Hussey, Milford, assignor to himself and Augustus O. Corbett, Boston, Mass.
110,045.—TUCK-CREASING ATTACHMENT FOR SEWING-MACHINES.—John C. Jenson, Chicago, Ill.
110,046.—CULTIVATOR.—Freeman C. Jewell, Rahway, N. J.
110,047.—CHURN.—John W. Jordan, Lexington, Va.
110,048.—PRINTING-INK.—Julius Kircher, Cannstadt, near Stuttgart, Wurtemburg.
110,049.—GLASSWARE AND METAL STEM-CONNECTION.—Charles Louis Knecht, St. Clair, and Thomas Adams, Stow township, Pa.
110,050.—LOOM.—William Samuel Laycock, Sheffield, England.
110,051.—BUHL-SAW.—Thomas Leavitt, Everett, assignor to "Sonnents Wood-Carving Company, Boston, Mass.
110,052.—CARTRIDGE-CAP EXTRACTOR.—John Logan and Daniel W. Eldredge, Boston, Mass.
110,053.—CHAIR.—Charles R. Long, Louisville, Ky.
110,054.—PURIFYING BENZINE.—George Lupton, Indianapolis, Ind.
110,055.—LAMP-BURNER.—George Lupton, Indianapolis, Ind. Antedated November 26, 1870.
110,056.—MOLD FOR MAKING GLASSWARE.—James B. Lyon, Pittsburgh, Pa.
110,057.—VELOCIPEDE.—Henry A. Maltby, Brownsville, Texas.
110,058.—HAIR-RESTORATIVE.—Allen C. Maxfield, Biddeford, Me.
110,059.—LIFE-RAFT.—David McFarland, New York, assignor to A. M. Ingersoll, Brooklyn, N. Y.
110,060.—BELT-SPLICE POINT-FINISHER.—John Cummings McLaren, Montreal, Canada.
110,061.—FIELD CORN-PICKING AND HUSKING-MACHINE.—George Meader and Charles Meader, Prairie Center, Ill.
110,062.—LIQUID METER.—Charles Moore (assignor to Jose F. De Navarro), New York city.
110,063.—TRUSS.—Charles Morrill, New York city.
110,064.—APPARATUS FOR DRESSING AND FURROWING MILL-STONES.—James Lee Norton, London, England.
110,065.—ANIMAL-TRAP.—Ebenezer Oliver, New York city.
110,066.—HITCHING-POST.—Wilson S. Owings, Pan Handle Postoffice, West Va.
110,067.—BOBBIN-WINDER FOR SEWING-MACHINES.—John L. Patch, Charlestown, assignor to himself and E. F. Tilden, Boston, Mass.
110,068.—ELASTIC MANE-TURNER.—Chamberlayne Phelps, Clayton, N. Y.
110,069.—CHAIN-CLUTCH.—Hiram Pitcher (assignor to himself and H. & G. O. Trowbridge), Fond Du Lac, Wis. Antedated December 9, 1870.
110,070.—DEVICE FOR ATTACHING THE SHANK TO MINERAL AND COMPOSITION BUTTONS.—Charles L. Potter, Providence, R. I.
110,071.—COMBINED LOCK AND LATCH.—Francis M. Ranous, Yreka City, Cal.
110,072.—BASKET FOR TILE-GRINDERS.—Peter C. Reniers, Pittsburg, Pa. Antedated December 10, 1870.
110,073.—DEVICE FOR TRIMMING CYLINDRICAL BRUSHES.—Arthur G. Risley, Utica, N. Y.
110,074.—LEATHER FOR NECK-YOKE FOR CARRIAGES.—Henry Sanders, Utica, N. Y.
110,075.—MACHINE FOR CUTTING CORKS.—Eilert O. Schartan, Philadelphia, Pa. Antedated December 9, 1870.
110,076.—CORK-MACHINE.—Eilert O. Schartan, Philadelphia, Pa.
110,077.—TYPE-SETTING MACHINE.—William Stephenson Shipley, Jersey City, N. J.
110,078.—SASH-LOCK.—Christian Sholl, Mount Joy, Pa.
110,079.—MORTISING-MACHINE.—William H. Sible, Harrisburg, Pa.
110,080.—PLOW-CLEVIS ATTACHMENT.—Henr C. Sieverling, Carrollton, Ill.
110,081.—PROCESS OF REMOVING EARTHY MATTERS FROM BRONZE AND OTHER CASTINGS.—Michael Smith, Somerville, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
110,082.—SAFETY-VALVE.—Henry F. Snyder, Williamsport, Pa.
110,083.—BASE-BURNING STOVE.—Israel Snyder and Peter C. Garrett, Cedar Rapids, Iowa.
110,084.—MANUFACTURE OF ALUM AND FERTILIZERS FROM MINERAL PHOSPHATES.—Peter Spence, Newton Heath, Manchester, Great Britain.
110,085.—HEAD-BLOCK FOR SAW-MILLS.—Franklin J. Staley (assignor to Long, Joseph & Carter), Indianapolis, Ind. Antedated December 9, 1870.
110,086.—JOURNAL-BOX.—Edward H. Stearns, Erie, Pa.
110,087.—STENCH-TRAP.—Daniel C. Stillson, Charlestown, Mass.
110,088.—CAR COUPLING.—Augustus F. Street, Zanesville, O.
110,089.—METHOD OF UNITING WOOD.—John A. Thompson, Auburn, N. Y. Antedated November 26, 1870.
110,090.—TELEGRAPHIC RELAY.—Benjamin Birdwood Toye, Toronto, Canada.
110,091.—TREE PROTECTOR.—Charles Henry Trumbull, Marion, N. Y.
110,092.—ALARM TILL.—Cyrus Tucker and William H. Tucker, Indianapolis, Ind. Antedated Dec. 9, 1870.
110,093.—RAILWAY AXLE.—James Wardrobe, Charles D. B. Fisk, John F. Curtis, and George Fetley, Carlin, Nevada.
110,094.—EXTENSION LADDER.—Thomas Watson and Charles Perry, Brooklyn, N. Y.
110,095.—DOUBLE-TREE FASTENER.—Decatur Werst (assignor to himself and Joshua Laffin), South Bend, Ind.
110,096.—BARREL.—James W. Weston, New York city.
110,097.—PATTERN FOR MEASURING AND LAYING OUT GARMENTS.—Fannie Wetmore, Chicago, Ill.
110,098.—ROLLER-SHAFT FOR WRINGERS.—Levi H. Whitney, Washington, D.C. Antedated Nov. 26, 1870.
110,099.—FAUCET.—Franz Wiesenhofer, Fremont, Ohio.
110,100.—WEIGHING WAGON.—Geo. A. Wilcox, Chicago, Ill.
110,101.—SCHOOL DESK.—Elijah Wilson, New Brighton, Pa.
110,102.—MANUFACTURE OF EMERY WHEELS.—John F. Wood (assignor to "The Union Stone Company"), Boston, Mass.
110,103.—FRICTION BLOCK FOR ATTACHING CULTIVATOR AND OTHER TEETH.—William Workman and Jason Hitchcock, Ripon, Wis.
110,104.—HEATING STOVE.—Thomas Young (assignor to Ives & Allen), Montreal, Canada.
110,105.—CHEESE PRESS.—Robert Allen, Cleveland, Ohio.
110,106.—BARREL CHAMFERING AND CROZING MACHINE.—Truman M. Annis and Thomas B. Luce, Linden, Mich.
110,107.—WAGON.—Ephraim Ball, Jr., Canton, Ohio.
110,108.—PRESERVING SWEET POTATOES.—Hedgemon T. Basye, Dyersburg, Tenn.
110,109.—MACHINE FOR TILLING OR CULTIVATING.—Henry Belmont, Romford, England.
110,110.—STEAM JET PUMP.—Albert J. Blakslee and Garner C. Williams, Du Quoin, Ill.
110,111.—MEAT AND VEGETABLE CUTTER.—George E. Bringman, Philadelphia, Pa.
110,112.—REFRIGERATOR.—Andrew J. Chase, Boston, assignor to himself and Perrin C. Drisko, Boston (Highlands), Mass.
110,113.—BRICK PRESS.—James F. Clark, Morenci, Mich.
110,114.—STEAM PIPE COUPLING FOR RAILROAD CARS.—Joseph Conner, Philadelphia, Pa.
110,115.—BUCKLE.—Eugine P. Corwin, Washington, Ill.
110,116.—BOAT DETACHING APPARATUS.—John C. Cottingham, Philadelphia, Pa.
110,117.—CAR-AXLE BOX COVER.—David Cowley, Erie, Pa.
110,118.—FURNACE FOR BURNING SHAVINGS.—Lucius Crandall, New York city.
110,119.—HEAD BLOCK.—Perley M. Cummings, Cincinnati, Ohio, assignor to himself and Joseph D. Clark, Erie, Pa.
110,120.—PIANOFORTE ACTION.—Willard G. Day, Baltimore, Md.
110,121.—ASPHALT ROAD AND PAVEMENT.—Edward J. Desmedt (assignor to Grahamite Asphalt Company), New York city.
110,122.—OAT CLEANER.—Simon Dickens, Jr., Milwaukee, Wis.
110,123.—GROOVING TOOL.—Joseph Dill, Grand Rapids, Mich.
110,124.—MACHINE FOR SEPARATING COCKLE FROM WHEAT.—William G. Douglas and Hugh Thomas Douglas, Warrenton, Va., and John Milton Reed, Omaha, Nebraska.
110,125.—COFFEE, TEA, AND SPICE CAN.—James M. Earle, Springfield, Mass.
110,126.—HOE.—James Fairley and Alfred Fairley, Birmingham, England.
110,127.—BUNG ELEVATOR.—David F. Fetter, New York city.
110,128.—CUT-OFF FOR CISTERNS.—Frank Fischer, Quincy, Ill.
110,129.—NOTES, CHECKS, ETC., TO PREVENT ALTERATION.—Charles Folsom, New York city.
110,130.—COAL BARGE.—Lawrence F. Frazee, Jersey City, N. J.
110,131.—GRAIN THRASHER AND SEPARATOR.—Henry Gill Mansfield, Ohio.

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110,132.—TREADLE FOR SEWING MACHINES.—James W. W. Gordon, Newport, Ky.
110,133.—HARROW.—James M. Harper, El Paso, Ill.
110,134.—COTTON SEED HULLER.—Jackson Harrington (assignor to himself, Ralph Wheeler, and Jonathan Dart), New London, Conn.
110,135.—HAY ELEVATOR AND CONVEYER.—T. E. Haymond, Morris, Ill.
110,136.—WELL TUBING.—George W. Hemenway, Elmira, N. Y.
110,137.—CLOTHES DRYER.—Israel Hogeland, Indianapolis, Ind.
110,138.—GRAIN BINDER.—A. S. Hoyt, Winona, Minn. Antedated Dec. 3, 1870.
110,139.—FARMER'S BOILER.—Joseph H. Hunter, Pennington Point, Ill.
110,140.—BRAKE FOR SEWING MACHINES.—Jas. W. Jacob (assignor to himself and John J. O'Donnell), Jeffersonville, Ind.
110,141.—VEHICLE.—John Jack, Tiskilwa, Ill.
110,142.—HARROW.—D. L. Jaques, Hudson, Mich.
110,143.—PILE FOR ARMOR PLATES.—Joshua Jeavons, Sheffield, England.
110,144.—NEEDLE SETTER FOR SEWING MACHINES.—Jacob Karr, Washington, D. C.
110,145.—CLOTHES DRYER.—James W. Kenning, Quincy, Mich.
110,146.—MECHANISM FOR OPERATING SHUTTLE BOXES IN LOOMS.—L. J. Knowles, Warren, Mass.
110,147.—SIDE-SADDLE TREE.—Andrew Lawrence, Louisville, Ky.
110,148.—COVER FOR TEA AND COFFEE CUPS.—Joseph Leach, New Harmony, Ind. Antedated Dec. 6, 1870.
110,149.—COTTON-RENOVATING MACHINE.—J. B. Lyons, Milton, Conn.
110,150.—SPRING SEAT FOR VEHICLES.—Wait Mead, Francis D. May, and R. L. Hoyt, Chestertown, N. Y.
110,151.—GEARING FOR MACHINERY.—Thos. T. Millett, Sr., Savannah, Ga.
110,152.—MILK CARRIER.—Lewis Morris, Havre de Grace, assignor to himself and G. W. Baker, Aberdeen, Md.
110,153.—WOOD PAVEMENT.—William S. Morse, Washington, D. C.
110,154.—WROUGHT-IRON COLUMN.—John W. Murphy, Philadelphia, Pa.
110,155.—FLOUR PACKER.—Addison H. Nordyke, Richmond, Ind.
110,156.—LUBRICATOR.—Thomas J. Nottingham, Cincinnati, Ohio.
110,157.—COAL GRATE.—Ira Packard (assignor to himself and J. W. Slaght), Lena, Ill.
110,158.—STEAM BOILER.—Patrick Quinn, South Newmarket, N. H.
110,159.—SASH BALANCE.—Charles R. Rand, Dubuque, Iowa.
110,160.—ANTI-FRICTION BOXES FOR AXLES.—Wm. O. Reid, Vienna, N. C.
110,161.—COMPOUND FOR BATING HIDES AND SKINS.—L. F. Robertson, New York city.
110,162.—IMPLEMENT FOR REMOVING CORNS, BUNIONS, ETC.—C. L. Roorbach, St. Clair, Pa.
110,163.—MATERIAL FOR BEARING SURFACES IN MACHINERY.—John Schieder, New York city.
110,164.—STRAW CUTTER.—V. J. Shryrock, Folsomville, Ind.
110,165.—SAND-PAPERING MACHINE.—S. F. Smith (assignor to Osgood, Smith & Co.), Indianapolis, Ind.
110,166.—SELF-ACTING VALVE OR CUTT-OFF FOR LIQUID CANS.—H. S. Snow, West Meriden, Conn.
110,167.—FRUIT AND VEGETABLE PARER.—Henry Soggs, Columbus, Pa.
110,168.—SPOKE SHAVE.—G. N. Stearns, Syracuse, N. Y.
110,169.—WATER WHEEL.—Ralph Stinson, Whitesville, Mo.
110,170.—FENCE.—W. W. Sullivan, Liberty, Ind.
110,171.—SHUTTLE-OPERATING MECHANISM FOR LOOMS.—E. P. Terrel, West Liberty, Ind.
110,172.—INDIA-RUBBER AND COMBINATION HOSE.—Wm. A. Torrey, Mont Clair, N. J.
110,173.—BRIDGE.—Marshall Turly, Council Bluffs, Iowa. Antedated Dec. 3, 1870.
110,174.—UPHOLSTERING SPRING.—H. C. Velie, Poughkeepsie, N. Y.
110,175.—MECHANICAL MOVEMENT.—William Walker, Odin, Ill.
110,176.—NAIL EXTRACTOR.—Wesley G. Ward, Fayette, N. Y.
110,177.—PUMP.—Wesley G. Ward (assignor to himself and A. M. Flickinger), Fayette, N. Y.
110,178.—NECK-TIE SUPPORTER.—Wm. A. Wicks, Baltimore, Md.
110,179.—MACHINE FOR MAKING COUPLING PINS.—Charles H. Williams, Cleveland, Ohio.
110,180.—MOP HEAD.—Lewis Williams, Arlington, Vt.
110,181.—WASHING MACHINE.—G. L. Witsil, Philadelphia, Pa.
110,182.—PUMP.—H. E. Wolcott, Elbridge, N. Y., assignor of two thirds of his right to R. B. Wheeler and E. B. Hoyt.
110,183.—WAGON BRAKE.—Jacob Wolfla (assignor to the Union Omnibus and Wagon Manufacturing Company), Cincinnati, Ohio.
110,184.—MACHINE FOR BENDING PLOW HANDLES.—Jacob Woodburn, St. Louis, Mo., and S. F. Smith (assignors to Osgood, Smith & Co.), Indianapolis, Ind.
110,185.—MECHANICAL MOVEMENT.—Jacob Wolf, Burr Oak, Mich.
110,186.—PEN.—G. W. Wooley, Washington, D. C.

## REISSUES.

4,196.—TUCK-CREASING DEVICE FOR SEWING MACHINES.—James Bolton, Chicago, Ill., assignor to the Singer Manufacturing Company.—Patent No. 46,871, dated March 21, 1865.
4,197.—INKSTAND.—Samuel Darling, Providence, R. I.—Patent No. 51,931, dated January 9, 1866.
4,198.—METALLIC ROOFING.—Seymour Hughes, Hudson City, N. J.—Patent No. 103,887, dated June 7, 1870.
4,199.—BIT STOCK.—L. J. Gunn and C. H. Amidon, Greenfield, Mass., assignees of A. C. Moore.—Patent No. 16,931, dated March 31, 1857.
4,200.—GEARING FOR MOWING MACHINES.—J. V. Strait, Litchfield, Ohio.—Patent No. 95,950, dated October 19, 1869.
4,201.—FURNACE FOR BURNING BONE-BLACK AND OTHER SUBSTANCES.—Adam Weber, New York city.—Patent No. 65,457, dated June 4, 1867.
4,202.—COMBINED INDIA-RUBBER AND STEEL SPRINGS.—The National Spring Company, New York city, assignees of E. T. Russell.—Patent No. 10,280, dated November 29, 1853; extended seven years.

## DESIGNS.

4,503.—FRAME FOR A PAPER-BAG MACHINE.—C. F. Annan, Boston, assignor to himself and H. S. Merrill, Cambridge, Mass.
4,504.—BASE OF A HOT-AIR FURNACE.—Robert Boyd and J. C. Hart, Rochester, N. Y.
4,505.—SCYTHE.—C. P. Crossman, West Warren, assignor to himself, D. F. Hale, and Sidney Sanders, Chicopee, Mass.
4,506.—BROOM.—R. W. English, Buffalo, N. Y.
4,507.—CARPET PATTERN.—H. S. Kerr (assignor to Israel Foster), Philadelphia, Pa.
4,508 and 4,509.—CARPET PATTERN.—William Mallinson, Halifax, England, assignor to W. & J. Sloane, New York city. Two patents.
4,510 and 4,511.—COAL BOX.—R. W. Newbery, New York city. Two patents.
4,512 and 4,513.—CENTER-PIECE FOR CEILINGS.—J. W. Reeves (assignor to W. H. French), Philadelphia, Pa. Two patents.
4,514.—SHOW CASE.—R. J. Roberts, New York city.
4,515.—COOKING STOVE.—J. R. Rose and E. L. Calely, Philadelphia, Pa., assignors to Armstrong Company, Port Deposit, Md.
4,516.—BRACELET.—T. I. Smith, Attleborough, Mass.
4,517.—HOE.—B. T. Stowell, Quincy, Ill.
4,518 to 4,520.—WOVEN FABRIC.—R. C. Taft, W. B. Weeden, and J. W. Taft, Providence, R. I. Three patents.
4,521.—PLOWSHARE.—R. H. Taylor, Lincoln, Va.

## TRADE-MARKS.

96.—RAZOR STRAP.—B. F. Badger, Everett, Mass.
97.—WAGON AXLE.—D. A. Brown & Co., Fisherville, N. H.
98.—ROOT AND HERB BITTERS.—Flint & Co., Providence, R. I.
99.—MEDICAL COMPOUND.—G. C. Furber, Yreka, Cal.
100.—BROOM AND BRUSH.—L. Y. Gardiner & Co., Amsterdam, N. Y.
101 to 104.—WHISKEY.—W. A. Gaines & Co., Frankfort, Ky. Four Patents.
105.—LEATHER.—G. F. Page and C. T. Page, Franklin N. H
106.—CIGAR, SNUFF, AND TOBACCO.—Lorin Palmer, New York city.
107.—OIL.—Charles Pratt, New York city.
108—CUTLERY.—R. J. Roberts. New York city.

## EXTENSIONS.

HARVESTING MACHINE.—W. N. Whiteley, of Springfield Ohio.—Letters Patent No. 16,131, dated November 25, 1856; reissue No. No. 1,208, dated June 25, 1861; reissue No. 1,614, dated February 2, 1864.—Division A.
HARVESTING MACHINE.—W. N. Whiteley, of Springfield Ohio.—Letters Patent No. 16,131, dated November 25, 1856; reissue No. 1,208, dated June 25, 1861; reissue No. 1,615, dated February 2, 1864.—Division B.
WATER WHEEL.—John Tyler, of West Lebanon, N. H.—Extended by Act of Congress, Approved July 7, 1870.—Letters Patent No. 15,309, dated July 8, 1856; reissue No. 3,015, dated June 30, 1868.
RAILROAD CAR SEAT AND COUCH.—T. T. Woodruff, of Philadelphia, Pa.—Letters Patent No. 16,160, dated December 2, 1856.
RAILROAD CAR SEAT AND COUCH.—T. T. Woodruff, of Philadelphia.—Letters Patent No. 16,159, dated December 2, 1856; reissue No. 1,439, dated March 17, 1863.
MACHINERY FOR PREPARING FIBROUS SUBSTANCES FOR SPINNING.—James Apperly and William Clissold, of Dudbridge, England.—Letters Patent No. 18,388, dated December 2, 1857; antedated December 4, 1856.

## APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR COMPOSING AND DISTRIBUTING TYPE.—William H. Houston has petitioned for an extension of the above patent. Day of hearing March 15, 1871.

BREECH-LOADING FIRE-ARMS.—William Cleveland Hicks, Summit, N. J.—has petitioned for an extension of the above patent. Day of hearing Feb. 22 1871.

MACHINES FOR MAKING AXES.—G. F. Hutchins, East Douglas, Mass., has petitioned for an extension of the above patent. Day of hearing Feb. 15 1871.

KEEPER FOR RIGHT AND LEFT HAND LOCKS.—Calvin Adams, Pittsburgh, Pa., has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

GIG MILLS FOR NAPPING CLOTH.—Ernest Gessner, Aue, Saxony, has petitioned for an extension of the above patent. Day of hearing Feb. 8, 1871.

## Answers to Correspondents.

*CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.*

*SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.*

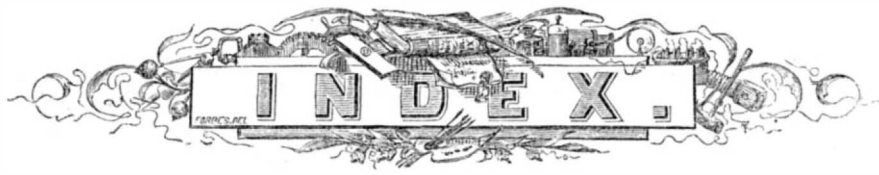
*All reference to back numbers should be by volume and page.*

G. L. B and others.—We have already published two replies to the article on spiritualism, which seem to cover all that is requisite to show the ground of diference between its believers and Dr. Hammond s hypothesis. We decline to publish more at present.

F. S. C., of Mass.—The information you seek through our columns would probably bring out a great variety of specifics, none whichought to be taken without advice. We prefer not to dabble in tha branch of science.

J. W. C., of Iowa.—We did not recommend the English system of non-examination, to be adopted in our patent office. We copied the article from the *Tribune*, and gave that journal credit for it.

H. B., of R. I.—You will find a full description of the construction of the caisson of the Brooklyn bridge in the SCIENTIFIC AMERICAN for July 2d, it being there port of the Engineer.

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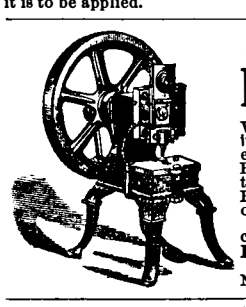

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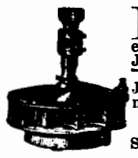

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